

CALIFORNIA

HIGHWAYS AND PUBLIC WORKS



NOVEMBER-DECEMBER
1959

inches

4 3 2 1 0

centimeters

10 9 8 7 6 5 4 3 2 1 0

D50 Illuminant, 2 degree observer

Patch #	L*	a*	b*	Density
1	38.12	13.24	15.07	0.04
2	65.43	21.25	18.11	0.04
3	49.87	20.96	22.29	0.04
4	44.26	22.83	24.49	0.04
5	55.56	24.49	24.49	0.04
6	70.82	17.32	28.36	0.04
7	63.51	33.92	43.07	0.04
8	52.24	37.06	43.96	0.04
9	39.92	52.24	59.81	0.04
10	97.06	1.13	1.13	0.04
11(A)	92.02	0.23	0.23	0.09
12	87.34	0.21	0.43	0.15
13	82.14	0.43	0.43	0.22
14	72.05	0.28	0.28	0.38
15	62.15	0.19	0.19	0.51

Golden Thread

Patch #	L*	a*	b*	Density
16(M)	48.25	38.62	28.86	0.01
17	38.62	28.86	16.19	0.04
18(B)	16.19	8.29	0.73	0.09
19	8.29	0.19	0.19	0.73
20	3.44	3.44	3.44	0.45
21	31.41	31.41	31.41	0.04
22	72.46	72.46	72.46	0.04
23	72.46	72.46	72.46	0.04
24	72.95	72.95	72.95	0.04
25	29.37	29.37	29.37	0.04
26	54.91	54.91	54.91	0.04
27	43.96	43.96	43.96	0.04
28	82.74	82.74	82.74	0.04
29	52.78	52.78	52.78	0.04
30	50.87	50.87	50.87	0.04

Colors by Munsell Color Services Lab

Don Williams



Recently completed section of US 40 (Interstate 80) in Truckee Canyon a few miles west of California-Nevada state line (see page 2).

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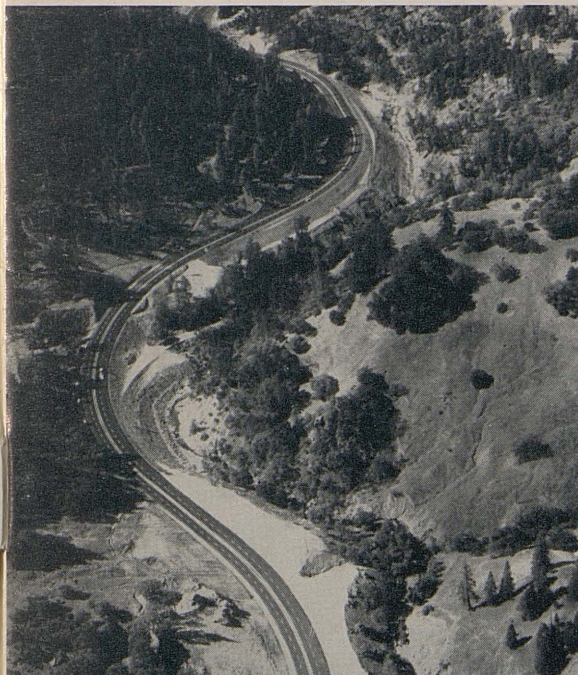
BACK
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California Highways and Public Works

Official Journal of the Division of Highways, Department of Public Works, State of California



MAIN COVER—Recently completed expressway construction on U.S. 99 north of Shasta Lake. The channelized intersection will ultimately be replaced with an interchange when this section is developed to a full freeway under the Interstate Program. The orange snow markers have been placed for the winter season to guide the snowplow operators. (See Report From District II, page 12.)



BACK COVER—Looking northerly along the new section of freeway on U.S. 101 (The Redwood Highway), in Rattlesnake Creek Canyon, about 12 miles north of Laytonville. (See Report From District I, page 31.)

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November-December

Nos. 11-12

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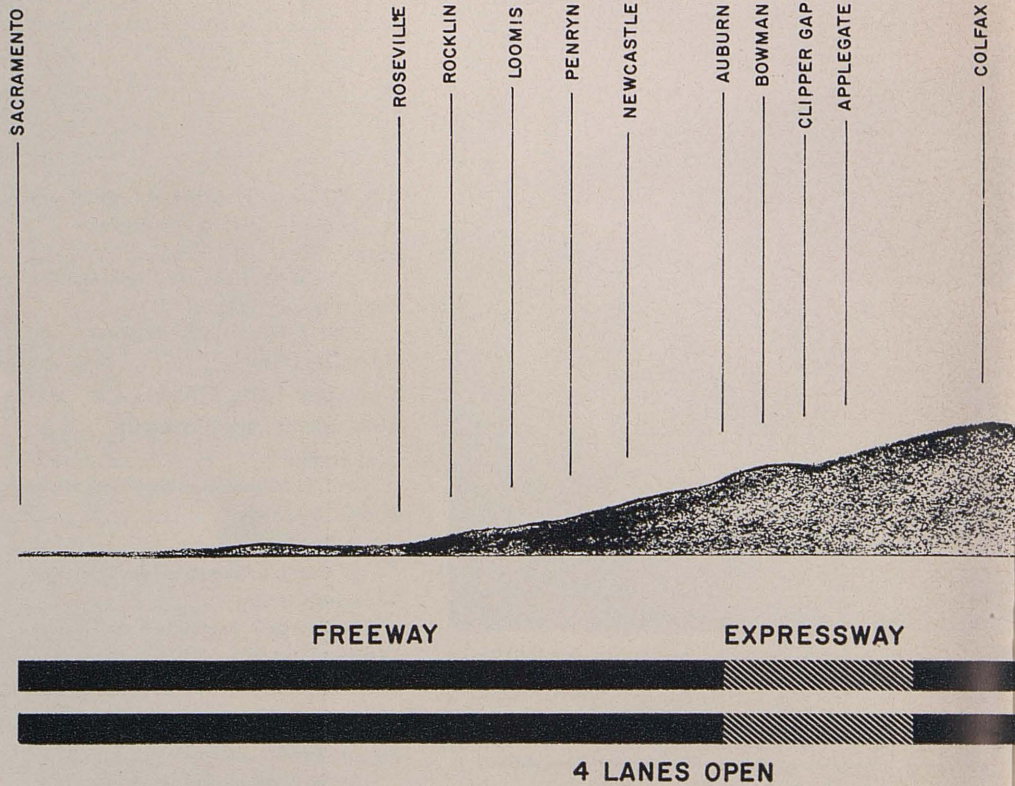
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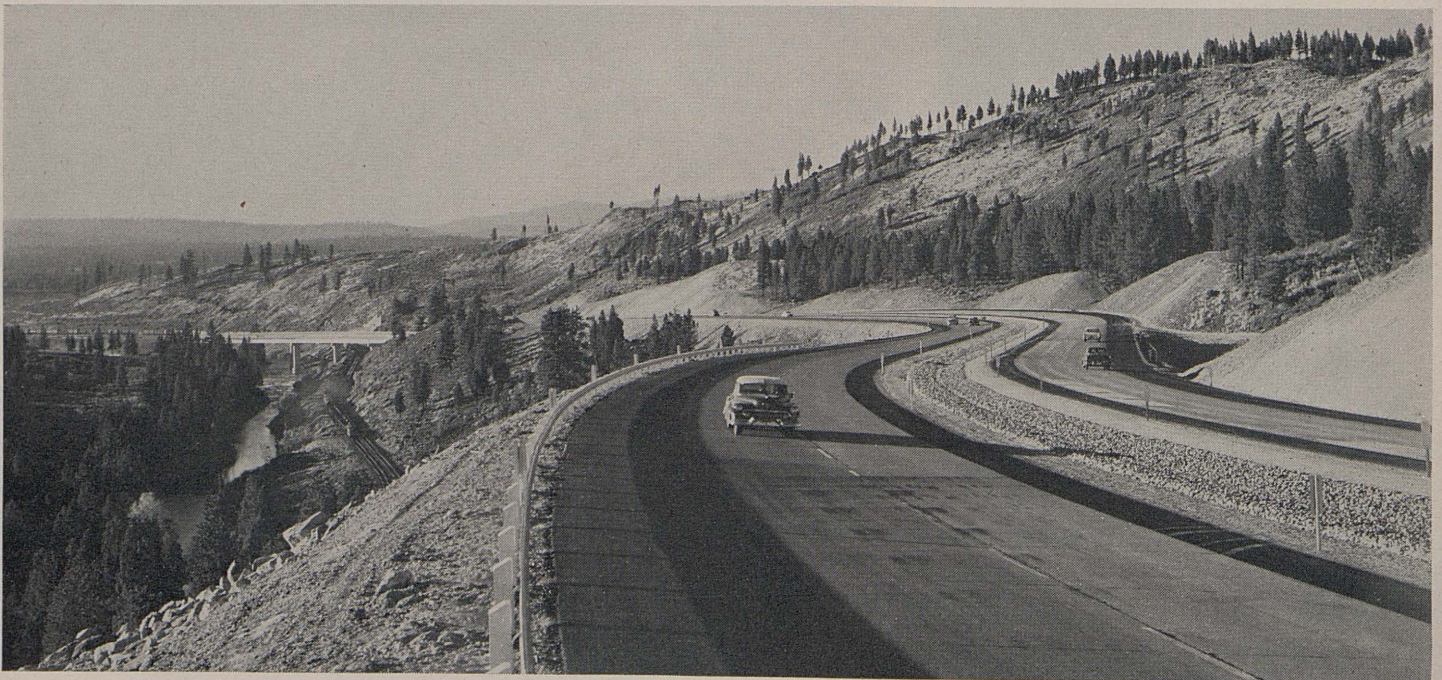
SACRAMENTO 7, CALIFORNIA

U.S. 40 Gets 37.5

FIVE
NEW
SECTIONS
OPENED
THIS
YEAR
BETWEEN
ROSEVILLE
AND
STATE LINE



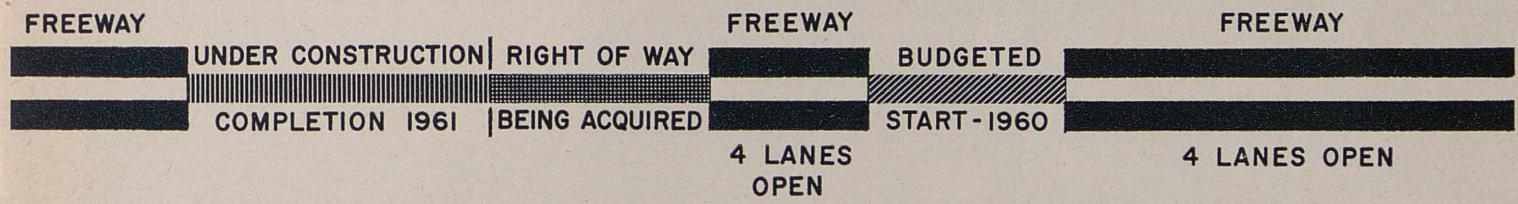
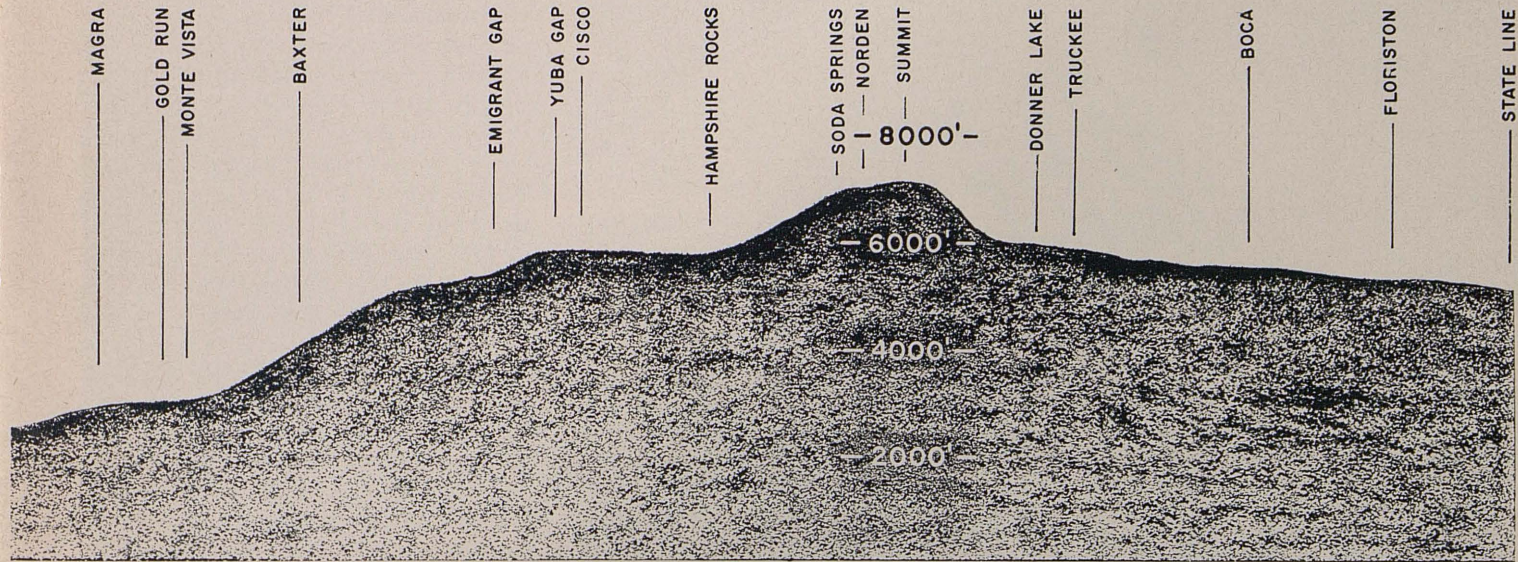
By ALAN S. HART, District Engineer



Boca Bridge and Overhead upper left with Southern Pacific freight passing beneath. Looking west near upper end of Truckee Canyon.

More Freeway Miles

COLFAX



U.S. 40 has had more improvements completed in 1959 than in any other year in its history. Five new sections of full freeway, totaling 37.5 miles, were opened this year, and travelers to the 1960 Winter Olympics in Squaw Valley will enjoy 58 miles of uninterrupted four lanes on double roadway between Sacramento and Monte Vista.

This stretch, however, includes approximately 10 miles of expressway in and east of Auburn which requires 10 interchange structures to convert it to full freeway. These will be asked for in a future budget.

Traveling east, from Sacramento to the Nevada state line, these are the new sections which have been completed this year:

1. Connecting to the Roseville Freeway northeast of Sacramento, an 11.5-mile section from Roseville to Newcastle. About 8½ of these miles are a

straight line across gentle undulations which are the beginning of the Sierra Nevada foothills.

This entirely new alignment south of the former route skirts the Towns of Rocklin, Loomis, and Penryn. The job, completed at a cost of \$7,000,000 by A. Teichert and Son, Inc. of Sacramento, was opened to use in early December.

2. Beyond Auburn, almost to the old hydraulic mining gravel cliffs near Gold Run, is the new section from Magra to Monte Vista. This 4.5 miles was opened in August after being completed at a cost of \$2,700,000 by Fredrickson & Watson Company, and Ransome Company, both of Oakland.

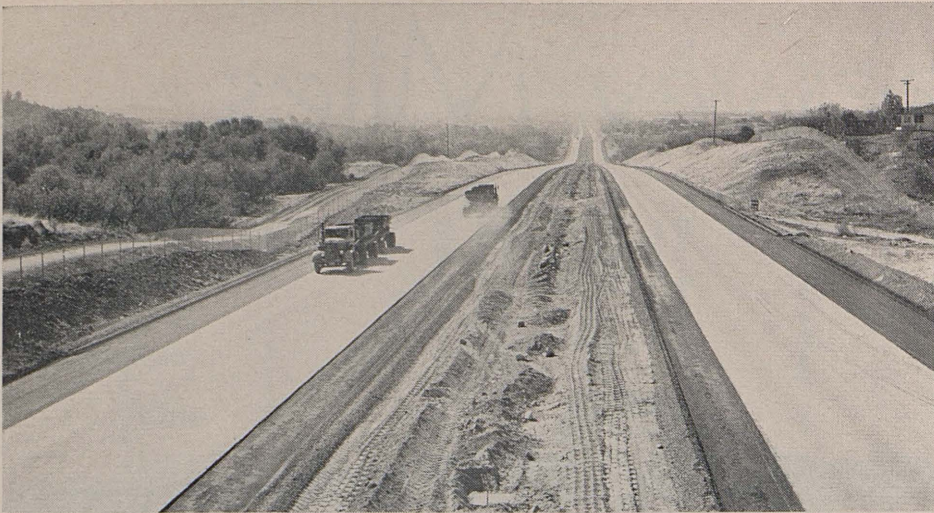
3. Much higher up, near the 6,000-foot level, the Hampshire Rocks to Soda Springs portion is now in use as a sample of what the high altitude section of the road will be like when it is complete. This six-mile portion,

mostly on two levels, is built higher on the slope than the old route, and travelers will see an exciting panorama of the surrounding peaks as they drive along the shoulder of the ridge. It was opened to traffic November 4.

The entire 21 miles from the east end of Donner Lake to the Nevada state line is now full freeway. Two major contracts in this area were completed in 1959, connecting to the section completed last year between the California-Nevada state line and Floriston. Both were dedicated in a joint opening ceremony near Truckee on September 24.

4. The 8.8 miles from Donner Lake to Boca, bypassing Truckee, was completed by Fredrickson & Watson Construction Co. and Ransome Company, both of Oakland, at a cost of \$7,620,606.

5. The 6.7 miles from Boca to Floriston was done by Isbell Construc-



Looking west on US 40 a few miles above Roseville on the new section between that city and Newcastle.



Recently opened new section looking east toward Magra Overhead.



Hampshire Rocks to Soda Springs portion just before completion while crews were completing asphalt shoulders.

tion Co. of Reno, Granite Construction Co. of Watsonville, and Gordon H. Ball & Gordon H. Ball, Inc. of Danville, at a cost of \$7,325,011.

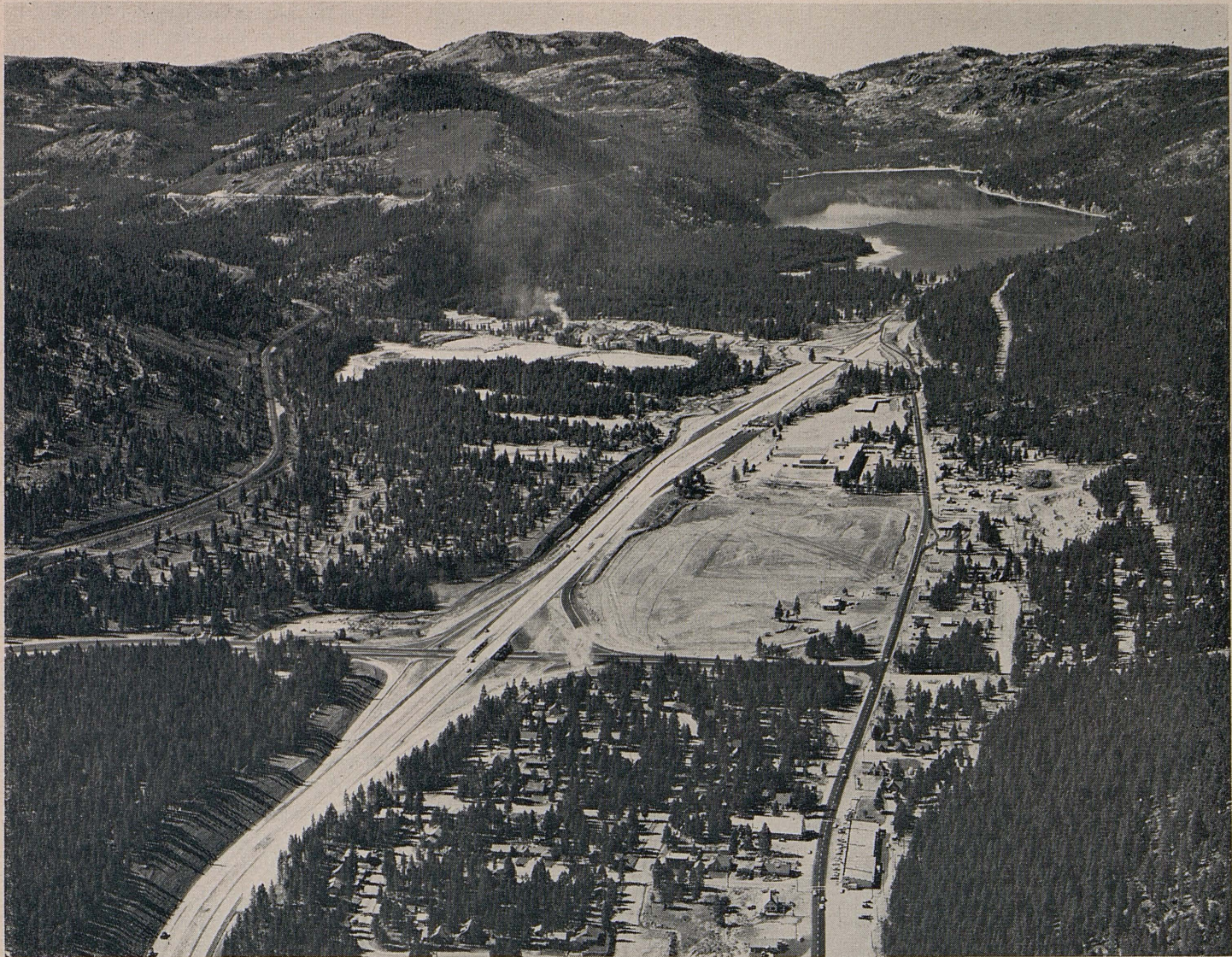
The Boca to Floriston contract completes the Truckee Canyon part of this route. Its conversion to interstate standards through this scenic canyon makes it truly one of the world's finest mountain highways. So narrow is the right-of-way in places, it was necessary to spend \$472,000 for a 2.8-mile detour in the Floriston-Hirschdale area, to avoid prolonged delay of traffic during construction.

This narrowness of the right-of-way in the section completed in 1958—Floriston to state line—provided such a scanty area for the road that a full median was not practicable, and this portion has only a four-foot median. Nevertheless, it is now possible to travel from Donner Lake to the state line at high cruising speeds over a road with gentle grades, wide sweeping curves, and no intersections.

On the section between Donner Lake and Boca a full diamond interchange has been provided in West Truckee at the intersection with State Sign Route 89, the route which will carry the Squaw Valley Winter Olympic Games traffic. State Route 89 has been reconstructed and widened to a 44-foot all-paved highway to handle the anticipated heavy traffic volume. Construction, comprising two 12-foot lanes with 10-foot paved shoulders, was completed several months ago at a cost of about \$1,400,000. A modern channelized intersection also was provided at the Squaw Valley turnoff. The contractor was Fredrickson & Watson Construction Company and Ransome Company.

A local road near the U. S. 40-State Sign Route 89 junction also has been improved to handle overflow northbound traffic around the Southern Pacific Railroad underpass. Traffic will be diverted over this road by the California Highway Patrol when conditions warrant.

Last summer resurfacing of 23 miles of Sign Route 89 from Bay View Rest on Emerald Bay, Lake Tahoe, north to the Squaw Valley Road was completed by Clements Construction Company of Hayward for approximately \$170,000.

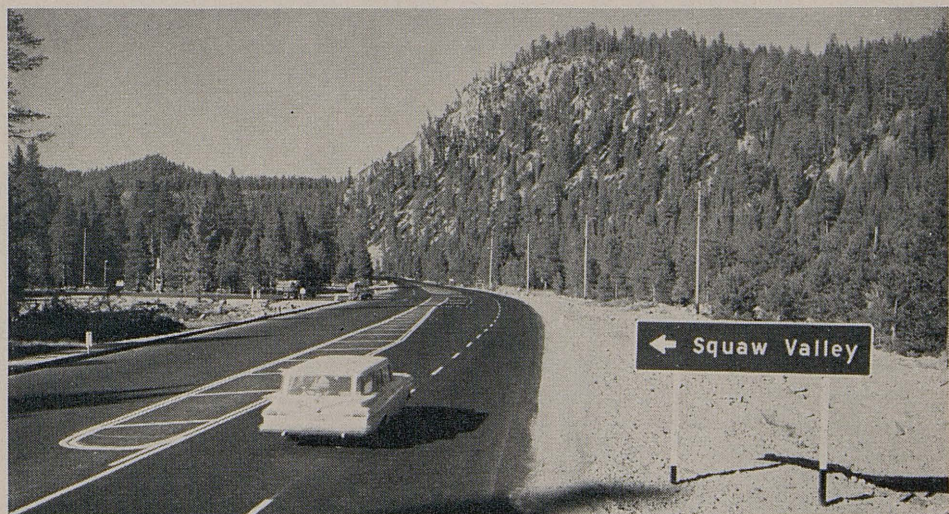


Aerial view of western outskirts of Truckee and US 40-State Sign Route 89 intersection which is turnoff for Squaw Valley. Donner Pass is lowest notch above Donner Lake in background. New alignment will cross summit farther to right. Site of new plant inspection station is just above right center.

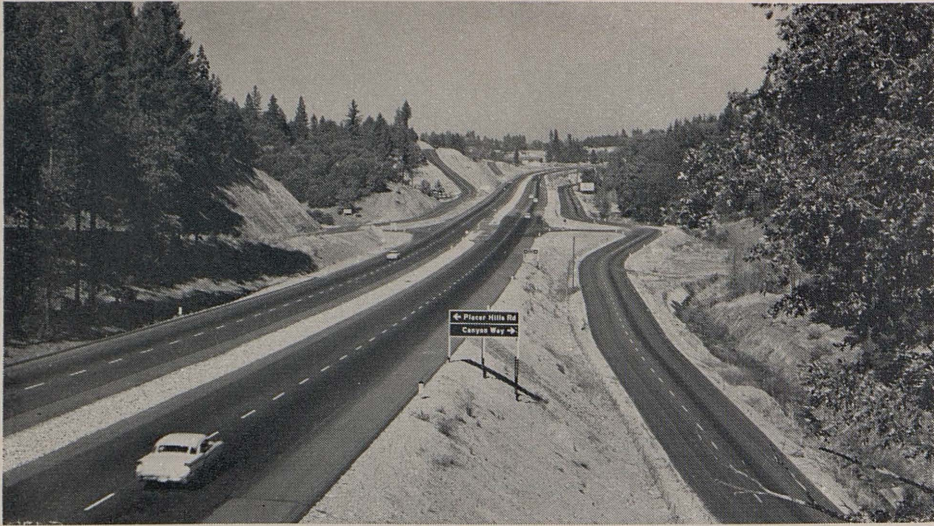
On the main highway, U. S. 40, which is also Interstate 80 in the new transcontinental network, only 35 miles of the old two-lane route remain. Thirteen miles of this is under construction, but will not be finished this year. Ten more miles are budgeted for construction, and 12 miles still await availability of funds.

Twenty-five of the thirty-five miles of old road are between Monte Vista and Hampshire Rocks. This is divided into four sections for modernization, with two of these sections now under construction.

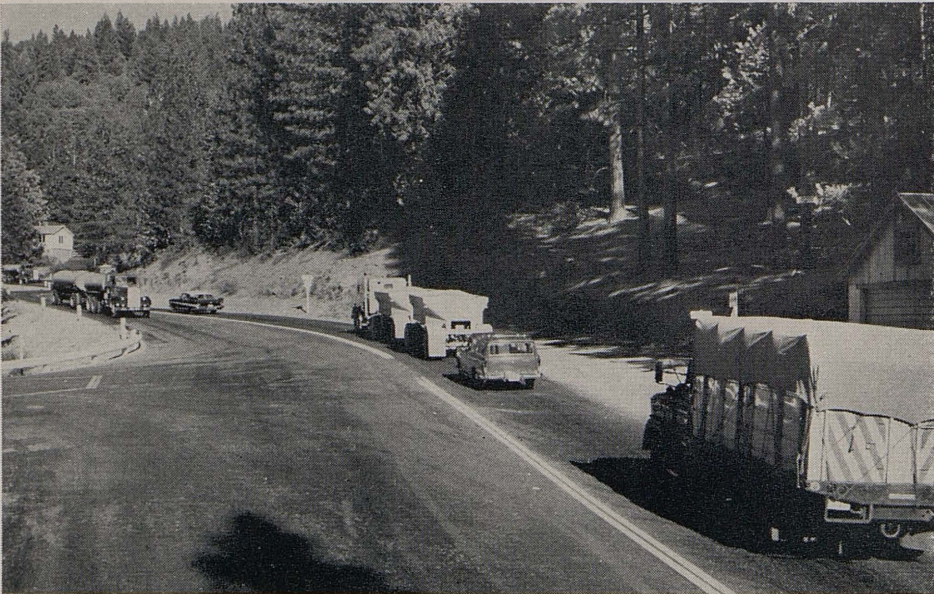
The five-mile Monte Vista to Baxter section got under way September 4 at a bid price of \$4,739,175 by the Madonna Construction Company of



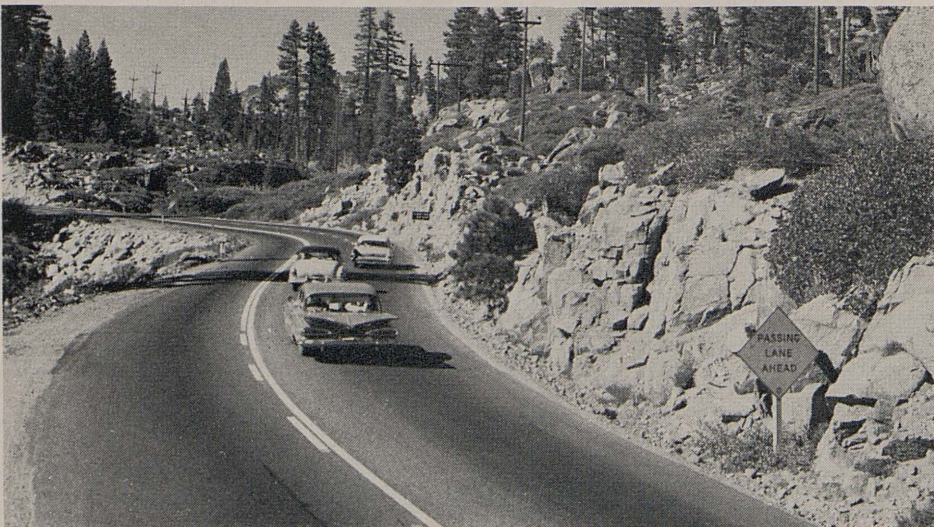
Recently rebuilt State Sign Route 89, looking northward at channelized intersection for Squaw Valley turnoff.



Section of expressway in vicinity of Auburn.



Reconstructed county road at Monte Vista provides detour around construction in this area.



Old road over summit is still only two lanes, but many passing lanes have been provided on up-grades.

San Luis Obispo, and is scheduled for completion in the summer of 1961.

The adjoining 7.8-mile section from Baxter to Emigrant Gap is under contract to A. Teichert & Son, Inc. of Sacramento on their low bid of \$4,787,742. Work started this spring and is expected to be completed next fall.

The two sections from Emigrant Gap to Hampshire Rocks, totaling 11.5 miles, are in the final stages of design, and right-of-way is being acquired.

From Hampshire Rocks to Soda Springs is the completed section mentioned above which eliminates the frustrating Kingvale Grade. With its long rows of cars behind slow-moving vehicles, this was an especially difficult drive in snow conditions.

The remaining section to be improved, and the most formidable from an engineering viewpoint, is the 10 miles from Soda Springs to the east end of Donner Lake. Climbing to more than 7,000 feet at the top of the pass, this part of the road must be driven with great care in winter, particularly the steep slopes just east of the summit. Blizzards and snow closed the road here for six weeks in January and February 1952.

The route has been adopted for a new summit crossing. It will be about 1½ miles north of the present pass, avoiding the steep eastern face the road now descends, and gradually descending the slope above Donner Lake to connect with the completed section just west of Truckee.

The estimated cost of rebuilding this 10-mile section is \$16,000,000. The 1959-60 State Highway Budget contains \$8,300,000 for grading and structures on a seven-mile stretch as the first unit of the overall project, which may take as much as four years to complete.

The rebuilding of U. S. 40 between Sacramento and the Nevada state line so far has cost \$58,000,000, with another \$10,000,000 committed for the two jobs currently under way. Including the estimated \$16,000,000 for the summit job, \$36,000,000 should be sufficient to complete conversion. This will make the total cost of modernizing the state line to Sacramento portion \$104,000,000.

A great investment in equipment as well as extra crews of men are required to keep U. S. 40 open in winter under normal traffic and weather conditions. With the large influx of spectators, contestants, and Olympics employees who will use the highway en route to Squaw Valley—from both east and west—snow removal will present extra challenges and extra problems. In the event of heavy snows during the games, the problem would be further magnified.

Included in the three years of advance planning for the conversion of U. S. 40, and for the games, has been the acquisition of an increased complement of snow removal equipment.

This is because of the more than doubling of highway mileage, or acreage to be cleared of snow, with the increase from a two-lane road to four-lane freeway.

There are currently 14 of the giant rotary plows in the mountain area, seven in the Truckee territory. Nine new ones will be delivered in the area prior to the snow season. They cost about \$35,000 each.

Also in the area are 76 conventional snow plows, including 20 new ones brought in so far this year. For lighter jobs, trucks and blades will be used. Other rigs are needed for sanding,

and still others for keeping signs clear.

An innovation in median delineators will greet motorists this winter in the Truckee Canyon section between Floriston and the state line. Proposed by the District III Traffic Department, the high-visibility centerline markers will provide an easy-to-see guide when the median is difficult to recognize during snowfall and inclement weather.

Of extruded plastic tubing four feet in height and about 1.5 inches in diameter, the markers are set in metal sockets anchored in the center of the four-foot paved median. The tubes have five alternate bands of orange-fluorescent and silver. The orange will give good daytime visibility and exceptionally bright contrast to snow; the silver will provide high nighttime reflectivity.

On straight stretches, the special delineators will be spaced about 200 feet apart with lesser intervals on curves. If they are overrun, the plastic tubes will give without damage to the vehicle.

The current installation is partially experimental and other sections of the highway will be proposed in the future if they perform as expected. The initial 5.4-mile contract was awarded

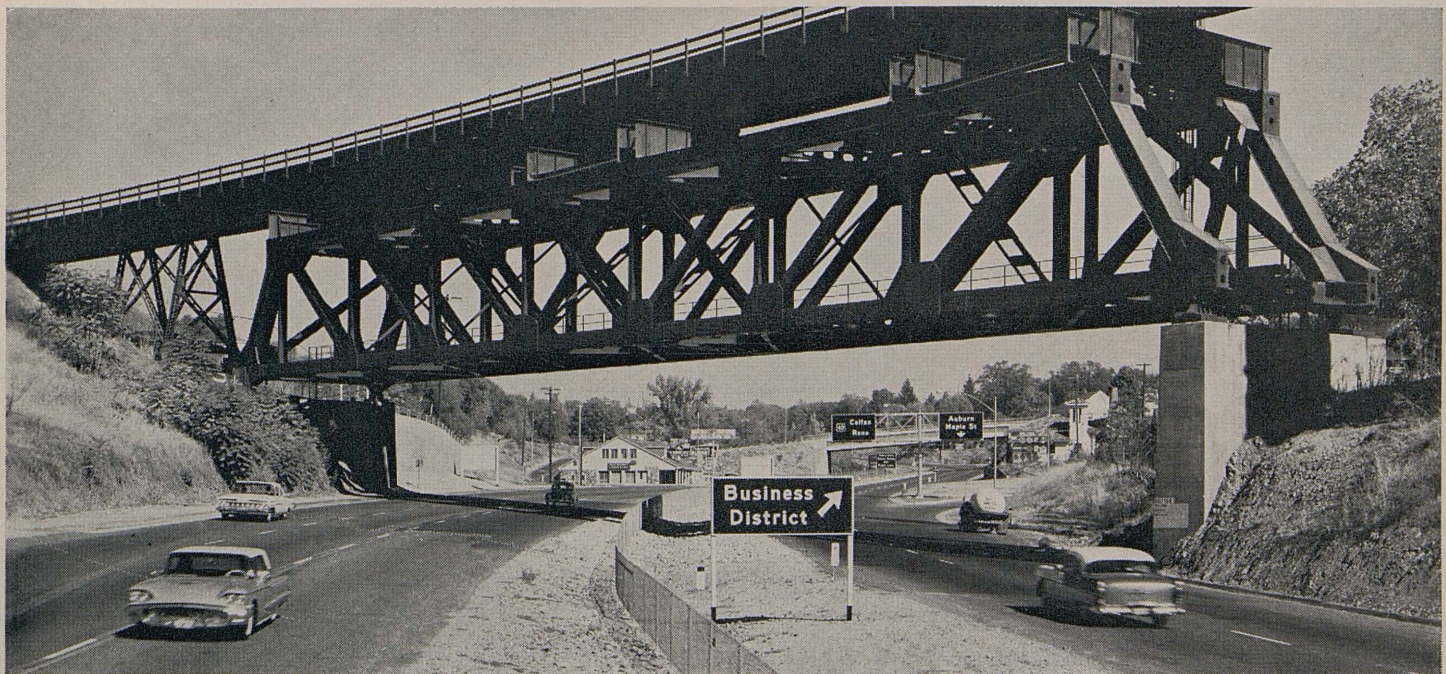
to Jay W. Wilmoth of Fresno on a low bid of \$1,928 and was completed on November 4.

As a part of the inclusive program designed to provide motorists attending the Olympics with the smoothest possible traffic flow and minimum of inconvenience and confusion, District III will erect no less than 60 special temporary directional signs in the Truckee-U. S. 40-S. S. R. 89 area in eastern Nevada and Placer Counties.

These signs will serve to direct traffic both to and from the games, mainly with reference to U. S. 40 and points east and west of Truckee. Included will be three cable-suspended overhead signs with changeable messages to adapt vehicle movement to altered road and traffic conditions.

For the Winter Olympics period, the State Highway Patrol plans to import 150 officers from other stations throughout the State to help manage traffic in the area. They will be headquartered in Truckee.

Every effort has been made, and will continue to be made, to give the Olympics visitor the safest, fastest, and most convenient access possible to Squaw Valley within the limits of time and availability of funds necessarily imposed on an undertaking of such magnitude.



West Auburn Underpass—U.S. 40's famous "Piggyback Bridge" and a new landmark. The steel supporting structure for the railroad bridge was designed by the Division of Highways Bridge Department to carry the railroad across the widened highway without a center pier. The work was carried out without interrupting train service.

Cement Test

*New Rapid Method Determines
Cement Distribution in Bases*

By DANIEL R. HOWE, Soils Engineering Associate, Materials and Research Department

FOR THE past several years there has been a growing need, during the actual construction period on California's highways, for a rapid field test which can be used to determine the distribution of portland cement in treated bases. This need has become more and more evident in recent times as aggregate quality was raised, cement content lowered and road mixing methods were being widely used.

With the exception of a few experimental projects dating as early as 1921, hardening of soils and base materials with portland cement began in California in 1937. In this early period mixing was accomplished by plows, disks and harrow methods with a fairly high cement content generally patterned after eastern "soil cement" practice. Later, modified bituminous mix plants of the pugmill type were used. In the plant operation, control of the ingredients by weight was usually good and little trouble was experienced in obtaining a uniform mixture.

In this latter period specifications were adopted requiring the use of processed aggregates having grading limits similar to those for untreated base material when cement treatment was to be employed. Minimum seven-day compressive strength requirements were also established for the treated mixture which had the effect of lowering cement contents considerably from those originally used for soils. About 1941 this product was named cement treated base or CTB and it retains this title at the present time.

In the late 40's and early 50's specifications permitted road mixing methods as a substitute for central plant methods and most contractors abandoned the plant method largely because of the increased daily production obtainable through road mixing.

From the engineer's standpoint however the lack of a rapid testing method in the road mixing type of operation made it more difficult and

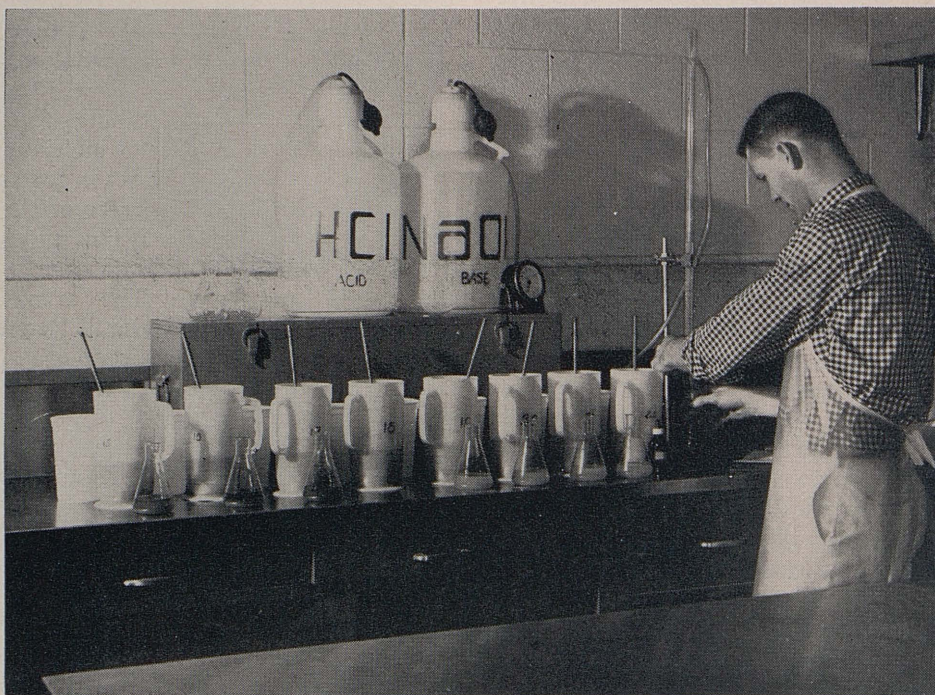


FIGURE 1—The acid-base titration test can also be easily performed at the construction site.



FIGURE 2—Layout for the performance of the constant neutralization procedure is illustrated above.

MATERIALS & RESEARCH DEPARTMENT
 Field-Laboratory Record of
ACID-BASE TITRATION TESTS
 (Cement Content Determinations of CTB & CTS)
 FORM T-3040 (ORIG. 10-57)

SHEET 1 OF 1 SHEETS
 DATE Nov. 6, 1957

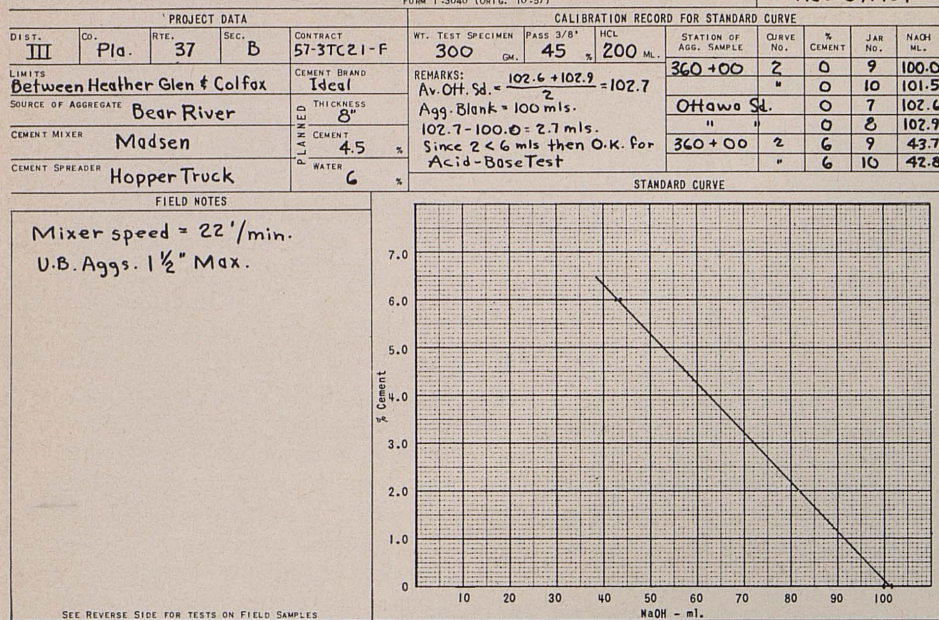


FIGURE 3—An example of a standard curve for the acid-base titration test.

often next to impossible to control several important variables in the construction of cement treated bases. Such things as the uniformity of material in the windrow, uniformity of cement spread in advance of mixing, uniformity and thoroughness of mixing due to high forward speeds of the mixer, size of the windrow in relation to the capacity of the mixer, depth of mixing as well as the mechanical condition of the mixer itself can all profoundly influence the uniformity of cement distribution. Furthermore the nonuniformity introduced by these variables cannot be controlled by normal methods of bulk quantity measurements. Somewhat similar variations and nonuniformities are experienced in plants of the continuous mix type when rigorous and reliable flow controls and ingredient feed interlocks are not provided. Actually only systematic quantitative tests giving measurements of physical factors related to cement distribution, performed on random samples, can provide the basis for the satisfactory evaluation of the efficiency of cement treated base mixing operations. It is the purpose of this article to describe such a test.

History of Tests

The California Division of Highways laboratory has in the past in-

vestigated several test methods which are aimed at determining the amount of cement in a sample of the mix. These tests are:

- (1) Chemical analysis in accordance with ASTM designation D-806;
- (2) Compressive strength tests to determine uniformity; and
- (3) Electrical conductivity measurements.

For various reasons these methods did not prove satisfactory for monitoring field mixing operations. The chemical analysis method must be performed in a well equipped laboratory by a trained chemist and the compressive strength method requires at least a week to obtain results. These are distinct disadvantages which preclude effective use for field control. The electrical conductivity method, which is a broad modification of a test developed for portland cement concrete by Mr. L. R. Chada of India, proved to be a vast improvement over the other two methods in that it can be performed on the project and requires only about three hours to obtain results. However the electrical method was found to be sensitive to soluble salt inclusions in the aggregates and this often precluded the use of the test in California coastal regions where the aggregates had been ex-

posed to ocean water or in certain inland areas where so-called "alkali" soils abound.

In the summer of 1957 our attention was directed to a method employed in England* for evaluating cement distribution by means of acid digestion and titration. The method as originally developed was used for soil-cement mixtures and required considerable modification before it could be applied with any degree of accuracy to the cement treated base mixtures used in California. However with modifications, a satisfactory test has been developed known as the "Acid-Base Titration Method," which may be easily and rapidly performed at the construction site.

Procedure Explained

The test is arranged, with respect to time, so that up to eight individual samples may be concurrently tested by one operator. Test specimens weighing 300 grams are prepared from the freshly mixed CTB and placed in plastic containers (approximately 2 qt. size). 200 milliliters of 3 normal hydrochloric acid (HCl) are then introduced into each sample and a standardized stirring procedure is followed for 18 minutes after which the acid is diluted to one normal concentration. In this process the acid neutralizes the cement and in the process there is a reduction in the acidity or Ph of the total solution. This reduction in acidity is measured by back titration with sodium hydroxide (NaOH) and the amount of NaOH required is inversely proportional to the cement content of the test specimen.

At 30 minutes after the first introduction of Hcl, a 100 milliliter aliquot portion of the residual acid is transferred to a beaker and prepared for titration by adding a small quantity of phenolphthalein solution. Titration is accomplished with 1 normal sodium hydroxide solution using a burette, graduated to 0.2 ml. The alkali is added slowly to the aliquot portion until a permanent red color is attained by the solution. The reading on the burette in milliliters will then indicate

* The Determination of the Cement Content of Soil-Cement III. An Investigation of Some of the Factors Involved by P. T. Sherwood. Journal of Applied Chemistry, 1957, 7, Nov. 1957.

the amount of NaOH that was needed to neutralize the residual acid.

In order to convert this burette reading into terms of percent of cement it is first necessary to establish a relationship for the particular cement, aggregates and water used on the project. This is accomplished by developing a "standard curve" from tests on prepared samples of the aggregate containing known amounts of the particular cement being used. Normally the curve is a straight line; therefore it is usually only necessary to perform tests on duplicate aggregate blank specimens (containing 0 percent of cement) and on duplicate specimens containing 6 percent cement. For convenience the titration values obtained are plotted on a graph against cement content as illustrated on an example of our work form in Figure 3. Since a straight line relationship exists between milliliters of NaOH and percent cement, it is merely necessary to draw a line between the averages of the paired tests. This then provides the standard curve from which the percentages of cement in individual field samples taken from the project may be determined.

Field and laboratory trials with the Acid-Base Titration method involving approximately 1,700 tests and 22 construction projects, indicates that the test provides a very satisfactory means of monitoring the distribution of cement. The test is comparatively simple and results can be obtained on groups of eight samples in about 45 minutes, excluding sampling and preparation time. Statistical studies show that the test is reliable and indicates a standard error of estimate of only ± 0.2 percent (cement).

Limitations Cited

Unfortunately this procedure cannot be used where the CTB aggregates contain significant amounts of such substances as limestone, calcite and dolomite. These minerals react to hydrochloric acid in a manner similar to portland cement and therefore cause false cement determinations. This condition is readily discernible and limiting test values are established which indicates to the operator when the test should not be used. It is estimated that in general this test will not

be usable for perhaps 10 percent of the CTB projects in California. However, in a few districts the rate will be considerably higher.

Alternate Procedure

As a result of this difficulty a supplemental test procedure, referred to as the "Constant Neutralization Method" was developed by the Materials and Research Department for use on projects where aggregates susceptible to acid exist. While this method utilizes the same apparatus as the acid-base test, it is somewhat more time consuming and tedious and therefore less desirable in cases where aggregates reacting to the acid are not involved. It does however, provide a satisfactory means of control testing in the cases where the acid-base test cannot be used.

The constant neutralization method can be performed on a maximum number of four 300-gram test specimens at one time. The specimens are placed in a plastic container to which 250 milliliters of water and a small quantity of phenolphthalein solution are added. The solution will immediately turn pink due to the release of hydration products from the cement. Then using a burette containing 3 normal hydrochloric acid the operator continuously adds acid and stirs

the mixture to maintain a colorless solution for a timed interval of one hour. He must not add any more acid than is just necessary to remove the pink color, for any excess acid will attack the susceptible aggregates. Likewise, if he does not add enough acid the hydration products going into solution from the cement will be arrested thereby affecting the end results. Conscientious attention to these details, by the operator, for the full time period of one hour is absolutely necessary in this test. The amount of hydrochloric acid used in this process is determined from volume measurements with a burette or by weight. Experience has shown that the amount is directly proportional to the cement content of the treated base sample. The cement content of the field sample is determined from a standard curve developed for the project using the constant neutralization method as illustrated in Figure 4.

Sample Preparation

The sampling and the preparation of representative specimens of cement treated bases presents a special problem in connection with both test procedures. In California, cement treated base aggregates are usually composed of coarse granular, graded materials. With such material the greater por-

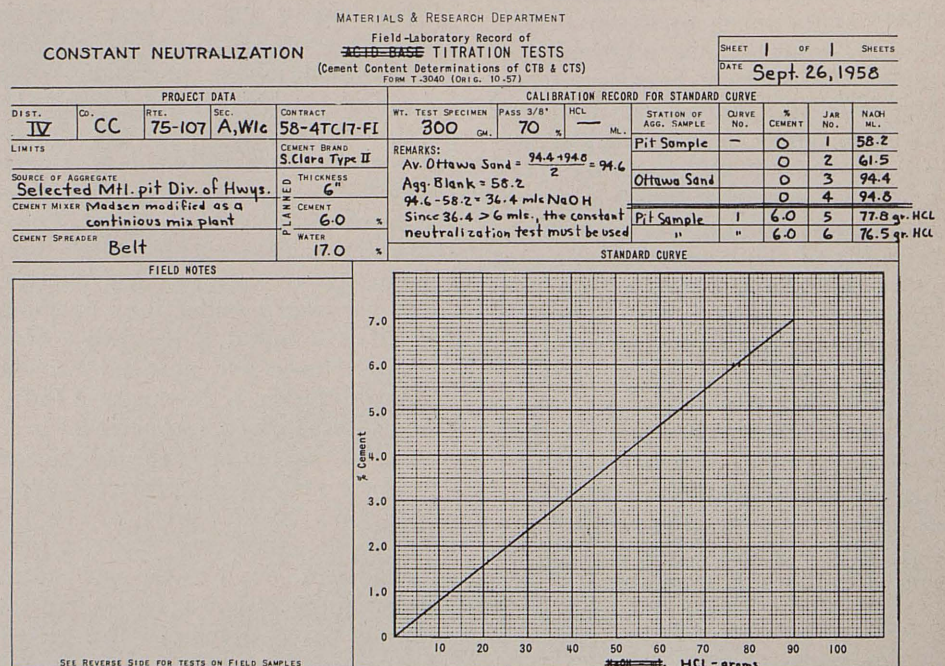


FIGURE 4—Example of a standard curve for the constant neutralization test.



FIGURE 5—The field kit for the acid-base titration test.

tion of the cement normally combines with the fines leaving a lesser amount adhering to the coarser particles. This makes it essential that tests be performed on specimens having the same ratio of coarse to fines as exists in the road or windrow after mixing. Testing the fine portion alone would not solve this difficulty as the amount of cement adhering to the coarse particles is somewhat variable depending on moisture content. It would also be necessary to prepare multiple standard curves representing various gradings or varying test specimen weights in order to accommodate changes in the coarse to fine ratio. It has been found simpler and more accurate to include, in the test specimen, the coarse aggregate up to the 1½" maximum size.

For the preparation of reliable test specimens, the field samples must be at least 3 kilograms in weight in order to be reasonably representative of the bulk material. Each sample is immediately separated on the ¾" sieve* and the proportions of the retained to passing calculated (including any retained 1½" material). Any aggregate retained on the 1½" sieve is then

* Consideration was originally given to separating the sample on the No. 4 sieve. However, the larger size is easier and faster for field operations where moist samples must be hand sieved.

wasted and the two sizes of material ($\pm \frac{3}{8}$ ") are recombined to form a 300-gram test specimen having typical proportions of plus to minus $\frac{3}{8}$ ". In the latter process, equivalent amounts by weight of the plus $\frac{3}{8}$ " aggregate are substituted for any wasted rock larger than 1½" in order to maintain the correct relationship of coarse to fines characteristic of the original field sample.

Statewide Field Control

Both of the titration procedures are incorporated in one test method for the California Materials Manual and district materials personnel are being equipped to perform the tests. The equipment has been conveniently arranged in kit form as shown in Figure 5. A chest has been designed for containing the numerous individual items (i.e. burettes, flasks, plastic containers, beakers, etc.) to minimize breakage and loss. Plastic containers have been used wherever possible including the 5 gallon carboys for holding acid and base working solutions. The entire equipment is easily and safely transportable in a station wagon type vehicle for field testing operations.

Since this method involves the use of acids and reagents it should be performed by technicians trained in lab-

oratory techniques. While corrosive liquids are involved and present some hazard to personnel if improperly used, the State Safety Engineer has approved the method on the condition that use be limited to trained laboratory personnel. It is therefore planned that engineers from the district materials department will perform the test as needed on various projects within their respective districts.

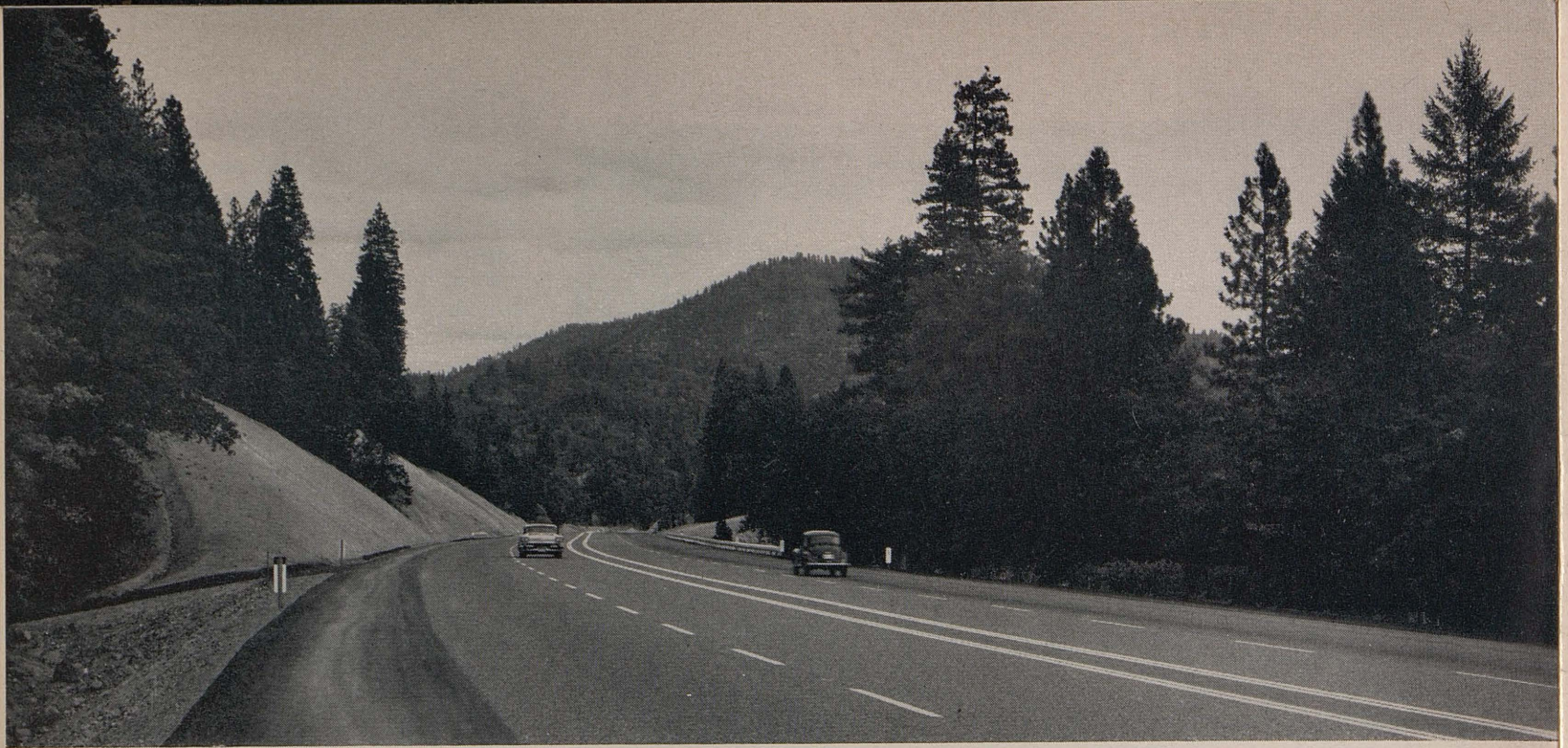
This new test method has already proved to be an invaluable tool for monitoring CTB operations. During the developmental stages personnel from Headquarters Laboratory made numerous field trips to try the test under various operating conditions. Much was learned from the data obtained about the operating characteristics of cement spreaders, cement and aggregate feeds and mixing equipment. It is our belief that application of the test on a statewide basis will bring inestimable benefits to the State by helping to secure cement treated bases of consistently uniform quality. With uniformity will come savings in cement as accurate control will result in equal quality with less cement.

Acknowledgments

This article covering the development of a titration method for determining the cement distribution in cement treated bases represents the combined efforts of a number of people. The work was carried out in the Materials and Research Department under the general direction of Mr. F. N. Hveem, Materials and Research Engineer and Mr. Ernest Zube, Supervising Materials and Research Engineer. In the earlier stages the work was supervised by Mr. George B. Sherman and later by Mr. Clyde G. Gates.

Recognition should be given to Mr. Arnold Trotter and Mr. John Borchert for their conscientious and persevering efforts during the research stages and also to Mr. Herbert Rooney and Mr. Tom Shelly of the Chemistry Section who provided valuable assistance in the perfection of the method of titration.

Special acknowledgment is made to Mr. Borchert who originated the idea for the constant neutralization test.



This new section of expressway was recently completed on U. S. 99 in the Sacramento River Canyon in Shasta County. The view is northward toward Pollard Flats.

Report From District II

By H. S. MILES, District Engineer

THE HIGHWAY needs of this section of northeastern California present a varied picture. The terrain varies considerably, with highways reaching from the floor of the Sacramento Valley through mountain passes to the forests and green valleys of Siskiyou, Modoc, Trinity, Plumas, and Lassen Counties.

On the through routes, interstate freight trucks comprise a substantial portion of motor vehicle travel. There are numerous sections of two-lane road where restricted sight distance and steep grades force passenger cars to "queue up" behind slow-moving truck and trailer combinations. These conditions have caused many accidents.

Lumbering is the main industry of the area and the hauling of timber and waste materials now used in the production of various commodities has put increasing demands on automotive

transportation. Livestock, minerals, and some farm products are also produced and reach market by truck which is often the only transportation available.

Recreational facilities in District II are among the best in the nation and tourists and vacationers are visiting the area in constantly increasing numbers. Camping and hiking in the mountains, fishing in the many streams and lakes, and boating and water skiing on the larger lakes and rivers are enjoyed by young and old alike during the summer season. The growing popularity of boating has increased boat trailer travel quite noticeably. Further increases are expected with the completion of the Trinity, Lewiston, and Whiskeytown Dams. Scheduled for completion in 1961, the reservoirs formed by these dams will add over 30 square miles of water surface to

Northern California. The addition of the recently completed facilities at the Mount Shasta Ski Bowl to the other ski areas of Northern California will lead to an increased influx of winter sport enthusiasts. The advent of hunting season in the fall is also a contributing factor to highway congestion.

The state highway system in District II provides two major north-south routes and two east-west arterials as well as a number of auxiliary local routes within the district. During the past several years emphasis has been placed on planning and constructing projects on the interstate system.

U. S. 99W and U. S. 99

U. S. Route 99W extends from the southerly district boundary at the Glenn-Tehama county line to Red Bluff and continues northward as U. S.



Mount Shasta forms an effective backdrop to this scene of U. S. Highway 97 north of Weed in Siskiyou County.



A new expressway section on U. S. 99 in the Sacramento River Canyon, Shasta County. Slate Creek Bridge is in the foreground; Mount Shasta in the background.

Route 99 through Redding, up the Sacramento River Canyon past the westerly side of Mount Shasta and through Yreka to the Oregon border. This route is part of the federal interstate highway system.

In the Redding area previous to last year, there were numerous private and public accesses to the highway from a business and residential district west of the expressway and just south of the city. This condition was a contributory factor in a number of accidents. To correct this deficiency, a 1.1-mile-long frontage road west of the expressway was completed in May 1958, which combined the accesses into three road connections to the expressway.

In the City of Redding, traffic congestion was lessened to a great extent

by the completion of a contract revising Market Street and Pine Street to one-way streets for use as the highway route through the business section of the city. Under the same contract, the two-lane highway north of the Sacramento River Bridge was reconstructed to a four-lane section with curbed medians to connect to a completed four-lane expressway north of Redding. The contractor was W. H. Darrough & Sons of Yuba City and the cost approximately \$308,000.

North of Redding for a distance of 11.8 miles to Bass Hill, a four-lane expressway completed prior to 1956 at a total cost of \$3,500,000 is adequate for present traffic but residential and business development will necessitate conversion of this section to a full freeway in the foreseeable future.

Studies for developing the 15-mile section from Bass Hill to Crespos to a full freeway are under way. This section was constructed in 1941 to replace the existing highway which was inundated by the lake created by the construction of Shasta Dam. It is an excellent two-lane road, considering the roughness of the terrain, but motorists are subject to considerable delay due to trucks and other slow-moving vehicles on steep grades. There are a number of vista points which afford the traveler excellent views of Shasta Lake and the surrounding mountains.

A long-planned four-lane freeway from the northerly end of Shasta Lake through the rugged Sacramento River Canyon and Dunsmuir to Big Canyon, a distance of approximately 30 miles, will soon be a reality with less than 14 miles yet to be completed. The remaining section is divided into three construction units as follows:

In July 1958, a contract was awarded for constructing 3.7 miles of four-lane freeway between one mile south of the Shasta-Siskiyou county line and the Sacramento River Bridge in Dunsmuir. The successful bidder was McCammon-Wunderlich Company and Wunderlich Contracting Company of Palo Alto with a low bid of \$4,222,000. A second contract was awarded in April 1959, for constructing 4.4 miles of four-lane freeway between one mile south of Castella and 0.7 mile south of the Shasta-Siskiyou county line. The successful bidder was Gibbons and Reed of Salt Lake City with a low bid of \$5,095,000. Funds in the amount of \$8,300,000 have been allocated for the remaining 5.9 miles of four-lane freeway between 0.6 mile north of Shotgun Creek and one mile south of Castella. The two projects under contract will be completed late in 1960 and will comprise the first section of full freeway in District II.

From Big Canyon through the picturesque mountain cities of Mount Shasta, Weed, and Yreka the two-lane Route U. S. 99, partially on old alignment and partially on new alignment, extends northerly across the Klamath River through the Siskiyou Mountains to the Oregon border. Except for resurfacing, no construction was done



This traffic channelization at the junction of U.S. 99 and State Sign Route 44 in Redding is part of the new one-way street system through the city.

on this section in the last two years. A project for constructing a 3.2-mile section of four-lane freeway between Weed and 0.3 mile north of the Shasta River will be under way soon, following the opening of bids on November 18, 1959. The section this construction will replace is a narrow, winding road especially difficult in winter due to snow and icing conditions.

In general, progress on the interstate system within District II is being made as rapidly as funds are available. Route adoptions and freeway agreements have been completed on approximately 105 miles of the 178 miles of interstate highway, and design is underway on units in each of the three counties traversed.

U. S. 40 Alternate

U. S. 40-Alternate in District II extends from Jarbo Gap through the scenic Feather River Canyon to U. S. 395 about eight miles west of the Nevada line. It is the lowest route over the Sierra Nevada Mountain

Range which all travel east from Northern California must cross.

In the last year one project was completed and one is still under construction on this route. A contract for grading and paving 5.2 miles of two-lane expressway on new alignment between Spring Garden and Sloat was completed by O. K. Mittry and Sons of Gardena at a cost of \$1,061,000 for construction. New reinforced concrete bridges at Chambers Creek and at Chipps Creek east of Storrie are now nearing completion. The contractor is G. S. Herrington of Auburn, whose bid was \$216,000.

The next scheduled construction on this route will be the grading and paving of 4.4 miles of the initial two lanes of an ultimate four-lane expressway between the junction of Sign Route 89 and Willow Creek, about four miles west of Portola. This project is included in the 1960-61 State Highway Budget with an allocation of \$1,450,000.

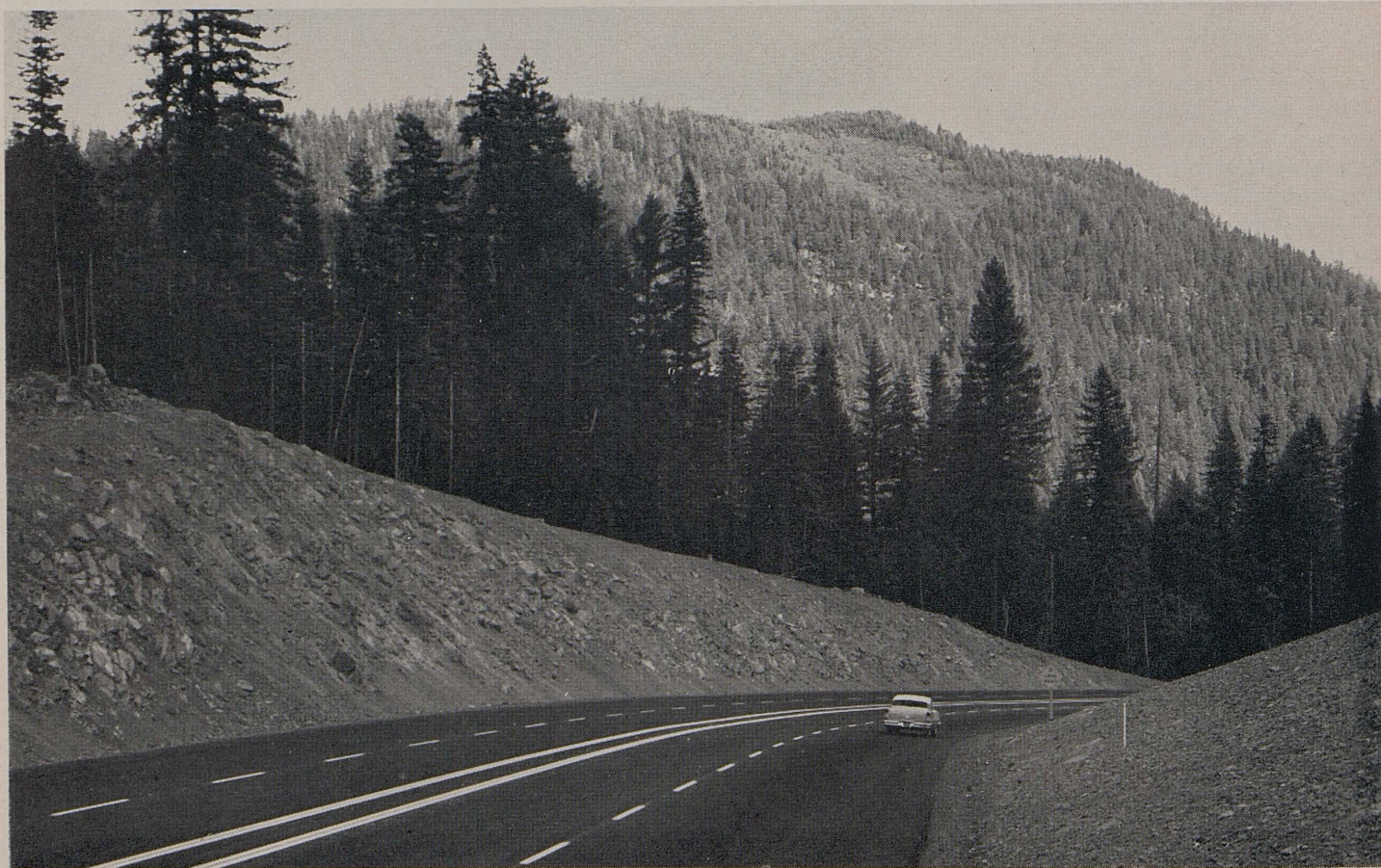
U. S. 299

U. S. 299 in District II extends easterly from the Humboldt county line through Weaverville to Redding, thence northeasterly through Burney, Fall River Mills, and Adin to Alturas where it connects to U. S. 395.

A project for constructing 0.3 mile of two-lane highway on new alignment between 0.2 mile west of Douglas City and the Trinity River was completed in October 1958. The cost was \$68,000 and the contractor, Harold P. Hastings of Lakeport. This work eliminated sharp curvature on the west approach to the Trinity River Bridge. Another project from the foot of Buckhorn Grade to the Trinity county line was completed in July 1958 by the same contractor at a cost for construction of \$51,000. This work provided passing lanes at five locations on the steep Buckhorn Grade. Hauling of materials and equipment for the Trinity Dam construction near Lewiston has resulted in an influx of slow-mov-



This winter scene is on State Sign Route 44 at the north entrance to Lassen Volcanic National Park in southeastern Shasta County.



A new four-lane section on State Sign Route 36 just south of Lassen Volcanic National Park in Tehama County.

ing vehicles which make these passing lanes highly essential.

The flow of traffic on Route U. S. 299 in the City of Redding was further improved by the replacement of the narrow, obsolete overhead across the Southern Pacific Railroad with a four-lane reinforced concrete structure. Including approaches, the entire project from Court Street to California Street was 0.2 mile long. The contractor was Stolte, Inc., of Oakland who completed the work in November 1958, at a cost of approximately \$250,000.

A contract was awarded to M. W. Brown of Redding in July 1958, for grading and paving 5.3 miles of two-lane highway on new alignment at two locations between 0.2 mile east of Hillcrest and three miles west of Burney. The low bid was \$1,203,000. When the project is completed, the entire section of highway across the rugged Hatchet Mountain area from Montgomery Creek to Burney will have been reconstructed on new alignment as a modern two-lane highway.

A contract for constructing the initial two lanes of an ultimate four-lane expressway between 2.5 miles east of Towerhouse and 2.5 miles east of Whiskeytown is scheduled to be underway by the end of this year. The relocation of this 5.1-mile section of highway, about 10 miles west of Redding, is imperative because the existing highway will be inundated by the proposed Whiskeytown Reservoir, a part of the Trinity Dam project. Construction of an 875-foot-long bridge across an arm of the reservoir will be part of the contract. The U. S. Bureau of Reclamation, who is participating in the cost of the project, has set December 1, 1961, as the date the reservoir waters will cover the existing road.

U. S. 395

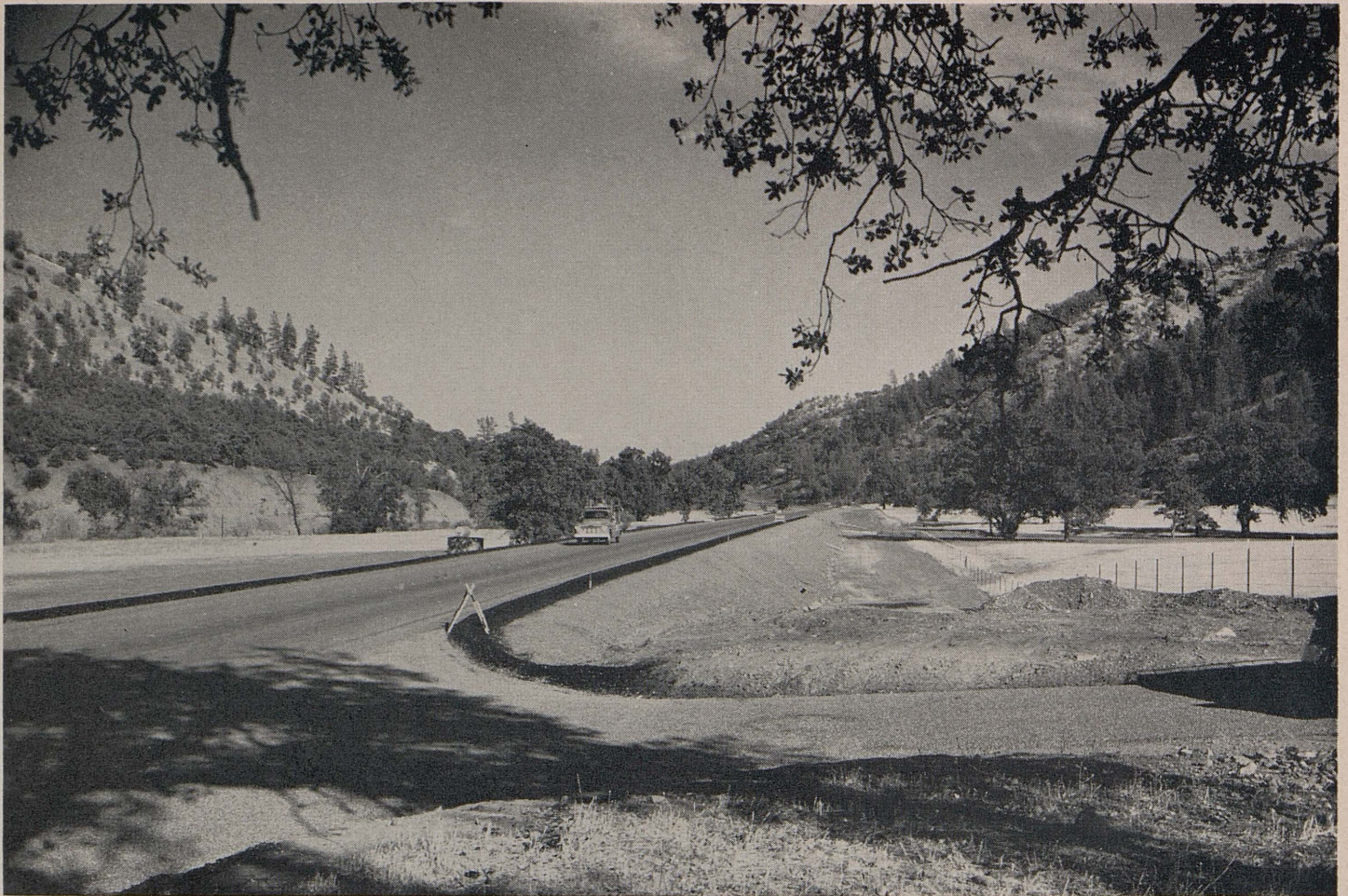
U. S. 395, known as the "Three Flags Highway," is an important inland route from Mexico to Canada. It enters the State and District II in the northeasterly corner of Sierra County and traverses the high desert plateaus and mountain valleys of Lassen and Modoc Counties to the Oregon border. A recent project on this route was the paving of 20.2 miles of highway between Ravendale and Madeline. The



The new highway and bridge on State Route 82 north of Fort Jones in Siskiyou County. The bridge on the old route across the Scott River (center) was washed out during the winter floods of 1955-56.



The California-Oregon State Line Road west of Tulelake. The route was recently taken into the State Highway System.



A new section of two-lane highway on State Sign Route 36 in Tehama County 31 miles west of Red Bluff.

contractor was Dorman Construction Company of Vancouver, Washington, who completed the job in October 1958, at a cost of \$405,000.

Projects for constructing 1.2 miles of initial two-lane for an ultimate four-lane expressway from 0.8 mile south to 0.5 mile north of the Lassen-Modoc county line and 11.9 miles from Baxter Creek to north of Milford will be the next scheduled work on this route. The 1960-61 Budget provides funds for both these jobs.

State Sign Route 89

State Sign Route 89 in District II extends from the Sierra-Plumas county line northerly through Quincy around Lake Almanor and through Lassen Park to U. S. 299 about five miles east of Burney. From there it continues northwesterly through McCloud to a junction with U. S. 99 about two miles south of Mount Shasta.

Construction work commenced in July of this year on the relocation of 2.2 miles of two-lane highway between 2.0 miles and 4.2 miles north of Canyon Dam. The Healy Construction Company of Palmdale with a low bid of \$266,000 is the contractor. The new alignment which skirts the shore of Lake Almanor eliminates a number of sharp curves.

A project for widening and surfacing 4.2 miles of two-lane highway between Legislative Route 86 and the Lassen Park boundary was recently completed. This southern entrance to the park is used in winter as well as summer, as it is the access route to a popular ski area.

A 5.5-mile base and surfacing project between 8.5 miles north of Hat Creek and U. S. 299, done to reinforce the existing roadbed, has just been completed. This improvement has made possible the removal of a load limit between the north entrance to

Lassen Park and U. S. 299. The work was performed by contractor M. W. Brown of Redding.

State Sign Route 36

State Sign Route 36 traverses the width of the district from Peanut, in Trinity County, through Red Bluff and Chester to U. S. 395 east of Susanville.

About 31 miles west of Red Bluff, efforts to improve this route were continued by the construction of a bridge and approaches between 0.2 mile west and 1.1 miles east of Dry Creek. The contractor was the Thomas Construction Company of Fresno who completed the work in September 1959, at a cost of approximately \$180,000.

A contract for grading and paving 4.9 miles of two-lane highway between 1.5 miles east of Lassen Camp and Mineral was completed in October 1958, by Stolte, Inc., of Oakland at a

... Continued on page 55

New Deputies

Three Deputy Directors,
CHC Secretary Appointed



FRANK A. CHAMBERS

FOUR NEW appointments to high-level posts in the Department of Public Works has been announced by Governor Edmund G. Brown and Director of Public Works Robert B. Bradford.

Frank A. Chambers, who had been Secretary of the California Highway Commission since January, was named Chief Deputy Director of Public Works.

Russell J. Cooney, formerly City Manager of Merced, was appointed Deputy Director of Public Works for Management.

Harry D. Freeman, formerly Director of Planning, Engineering and Development for the Sacramento Redevelopment Agency, was named Deputy Director of Public Works for Planning.

Jack Cooper, a Sacramento and San Diego newspaperman, was appointed Secretary of the California Highway Commission, replacing Chambers.

Chambers, who was a federal and state government official for 20 years prior to joining the department, will fill the post vacated by James F. Wright whose appointment as Deputy Director of the State Department of Water Resources was announced earlier.

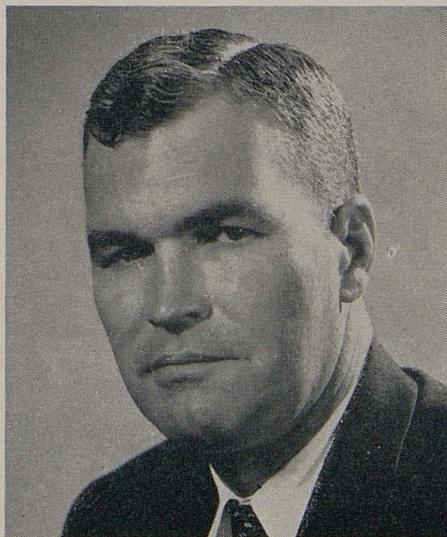
Chambers was Director of Business Service Centers for the western re-



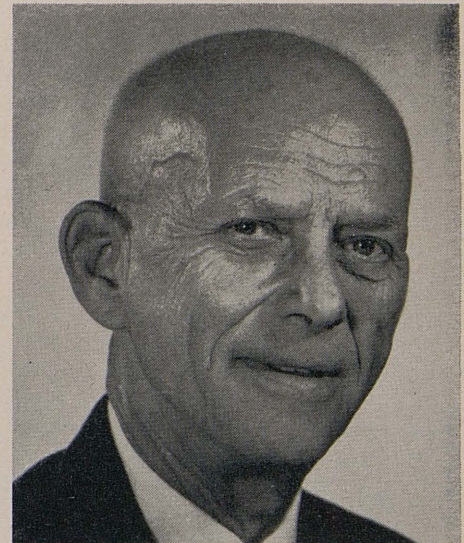
RUSSELL J. COONEY

gion of the General Services Administration of the federal government from 1950 through 1957. His headquarters were in San Francisco; his field of responsibility covered Arizona, California, Nevada and Hawaii.

During the 1940's, Chambers was with the U.S. Department of Labor, War Production Board, War Labor Board, War Manpower Commission, Small War Plants Corporation and War Assets Administration. He served in the Army Air Corps during World War II.



JACK COOPER



HARRY D. FREEMAN

He was born in San Francisco in 1910. He studied at St. Joseph's College in Mountain View.

Chambers and his wife, Emily, and their twin sons, Robert and Stephen, 12, live at 840 Los Molinos in Sacramento.

Cooney has been Merced's City Manager for the past eight years, and earlier served as personnel director in Pasadena and in San Mateo County.

Cooney has had special training in public administration at the University of Southern California and in management at Harvard University. Before entering public service, he did industrial relations work for Lockheed Aircraft.

He is married and has two children.

Freeman, a graduate of the University of Illinois, was Director of Planning for Portland, Oregon, before he came to Sacramento and has had long experience as a city planner both in city government and private practice.

Freeman is married and has no children.

The two new deputy positions occupied by Cooney and Freeman were authorized for the department by the 1959 Legislature.

The new Highway Commission Secretary, Cooper, has been chief of

... Continued on page 46

Posts Filled

*Three Key Appointments
Made by Highway Division*

THREE APPOINTMENTS to key positions on the California Division of Highways staff have been announced by State Highway Engineer J. W. Vickrey.

The appointments are:

J. C. Womack, promoted from Assistant State Highway Engineer—Planning to Deputy State Highway Engineer—Engineering.

John A. Legarra, promoted from Planning Engineer to Assistant State Highway Engineer—Planning.

L. L. Funk, Photogrammetric Engineer, transferred to Planning Engineer.

In his new position as Deputy State Highway Engineer, Womack will be replacing Vickrey, who was recently appointed State Highway Engineer upon the retirement of G. T. McCoy.

Womack's new responsibilities will include not only the various planning functions with which he has been identified since he was assigned to the Division of Highways Headquarters office in 1948 but also other engineering activities.

Born in Emmett, Idaho, in 1898, Womack studied at the University of Washington and spent seven years on road location and construction work for the U. S. Bureau of Public Roads in the Northwest. He joined the California Division of Highways in 1929,

as Location Engineer for District III, working out of Sacramento and Marysville.

He remained with District III, serving in planning, maintenance, construction and other assignments, until he was promoted to Planning Engineer for the Division of Highways in 1948. He was again promoted in 1955, to the position of Assistant State Highway Engineer—Planning, supervising the activities of six departments including Advance Planning, Programs and Budgets, Design, Traffic, Photogrammetry and Highway Planning Survey.

Womack served in World War I as a second lieutenant of field artillery. He is married and has two sons. His home is at 2653 13th Street, Sacramento.

Legarra, who moves up to Assistant State Highway Engineer—Planning, was born in Marysville in 1912, attended school in Stockton, and received his civil engineering degree from the University of California in 1934. He was in private engineering practice in Stockton from then until 1941, when he joined the Division of Highways.

He was assigned to District VI (Fresno) for a short period, then served with the U. S. Navy Civil En-

gineering Corps during World War II. From 1946 to 1951 he was with District X (Stockton) of the Division of Highways. He was then transferred to Headquarters office in Sacramento, first as assistant traffic engineer. In 1955 he was appointed Planning Engineer, serving in that post ever since except for several months as Design Engineer.

Legarra lives at 4920 Crestwood Way in Sacramento with his wife and four children.

Funk, the new Planning Engineer, was born in Chicago in 1901, attended high school in Sheridan, Oregon, and received his civil engineering degree at Oregon State College in 1921. After various engineering jobs in the Northwest, he was first employed by the Division of Highways in 1923 as a draftsman in its Dunsmuir office.

He left state service in 1925 to spend six years in mapping and tax appraisal work involving aerial photography. In 1931 he re-entered Division of Highways work in the District V office at San Luis Obispo, and was there until 1956, advancing to the position of Assistant District Engineer—Planning. His next move was to Headquarters

... Continued on page 46



J. C. WOMACK



JOHN A. LEGARRA



L. L. FUNK

Appointments

Three Named to Top Posts In Architecture Division

THE APPOINTMENT of Earl W. Hampton, who has been in charge of the Division of Architecture's design and planning service since last January to the new position of Deputy Chief, Architecture and Engineering, has been announced by State Architect Anson Boyd.



EARL W. HAMPTON

Boyd also made appointments to two new assistant state architect positions under Hampton in the division's Sacramento and Los Angeles offices.

Arthur F. Dudman, Principal Architect and head of the division's Sacramento Design Section for the past 13 years, will be Assistant State Architect in charge of design and planning in the north. Tom Meret, Principal Architect and Project Management Supervisor, will move to Los Angeles to take over the companion position in the south.

The three new positions were established as part of an extensive reorganization program under way in the Architecture Division. The changes are part of a realignment of top positions directed towards improved management control and efficiency.

Hampton entered state service in 1922 with the Division of Architec-

ture and for many years held various drafting and designing classifications.

In 1949 he was appointed head of the division's postwar design program performed by private architects. In 1953 he organized the Construction Budgets Section, which he supervised until 1955.

Hampton headed the division's budgets and fiscal affairs for four years prior to his appointment to the design and planning position nine months ago.

Hampton and his wife, Margaret, have two daughters, Erlene, of Sacramento, and Betsy, a student at the University of California in Berkeley.

Dudman's state service dates back to 1923 when he worked with the Division of Architecture for a short time as a junior architectural draftsman.

Following several breaks in service during which time he completed his formal architectural education and was employed in various architectural offices in San Francisco, Dudman was appointed Associate Architectural Designer in 1938, Senior Designer in 1945, Supervising Designer in 1946, and Principal Architect in 1948.

Dudman and his wife, Jean, live in Sacramento. They have no children.



ARTHUR F. DUDMAN

Meret joined the Division of Architecture in 1948 as an Associate Designer and was appointed Senior Designer a year later. In 1952 he was appointed Supervising Architect.

Meret took over the supervision of the Construction Budgets Section vacated by Hampton in 1955. Recently



TOM MERET

he was appointed Principal Architect and has headed the division's new Project Management Section which is developing improved methods for the control and management of the budgetary and working drawings processes engaged in by the division.

Meret and his wife, Helen, will soon move to Los Angeles. They have two daughters, Mrs. Dorothy Edelstein, of Lake Charles, Louisiana, and Mrs. Marjorie Snider, of Sacramento.

Successors to the positions formerly held by Dudman and Meret have not been named. Hampton's former position has been abolished under the reorganization plan.

Occupancy of the Pilot Rock Forestry Conservation Camp in San Bernardino County, the first of several such conservation camp centers, is scheduled to begin on December 15, 1959. The facility will accommodate 80 men.

Cost Index

Construction Prices Drop
During Third Quarter of '59

By J. P. MURPHY, Assistant State Highway Engineer and
H. C. McCARTY, Office Engineer

DURING the third quarter of 1959 the California Construction Cost Index returned to a lower level. The index now stands at 260.3 which is 10.1 points or 3.7 percent below the second quarter of 1959.

The index for both the second and third quarters is not believed to be a true measure of construction costs. A minimum number of projects was placed under way during these periods due to the uncertainty of federal highway legislation and the availability of future federal aid funds, particularly for interstate highways.

A project for the construction of the Webster Street Tube between Oakland and Alameda, with a bid value of \$16,641,000 was not included in the cost index computation as the concentration of money, the type of construction, and the unusual specifications for this project are not comparable to the normal highway project.

The other contracts for construction of the substructure and superstructure of the Benicia-Martinez Bridge, with a total bid value of \$14,238,400, were included in the computation of the cost index. A cost analysis of these projects showed no unusual unit prices for structural steel and bar reinforcing steel. Exclusion of these two projects would have resulted in an index figure of 256.3, which is only 4 index points or 1.4 percent lower than the index of 260.3 which includes these two projects.

The highway construction picture involves possible steel price increases, higher interest rates on financing and the wage increases in the construction industry. There is continued intensive competition for a smaller number of highway projects, occasioned by the reduction of interstate funds and federal project controls on the rate of advertising projects involving federal funds. Strong competition for projects exerts great pressure on contractors to

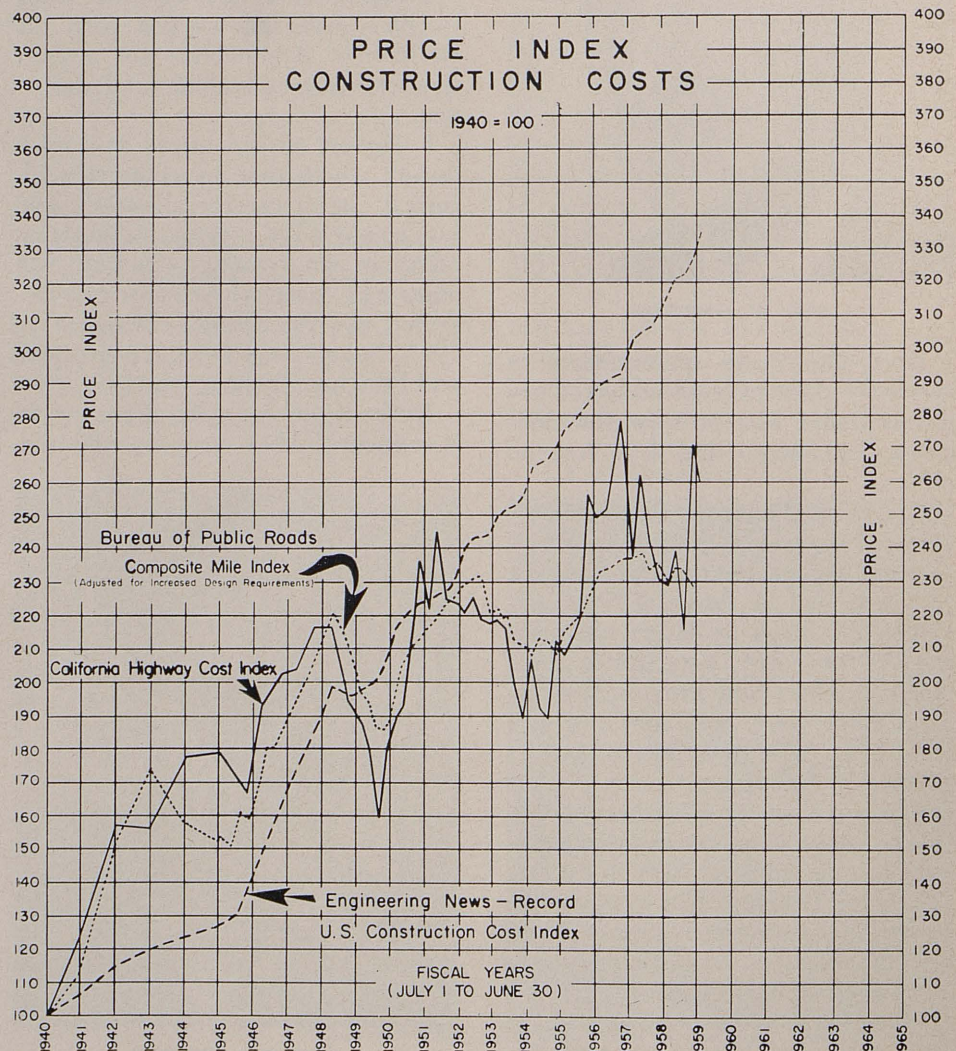
increase productivity and cut profits before raising their bid prices.

Bidder competition during the third quarter, with an average of 6.7 bidders per project, remained at a satisfactory level during the quarter. An accompanying tabulation shows the average number of bidders arranged according to types of construction and project value for the months comprising the third quarter of 1959.

The project values in this quarter are distributed as shown in the accompanying "Size of Projects" table.

Four of the seven items used in the preparation of this index show lower average unit prices while three items are higher than in the previous quarter. Principal reductions were in roadway excavation and portland cement concrete (structures). The reader's attention is called to the accompanying tabulation of Average Contract Prices.

The price for roadway excavation of \$0.53 per cubic yard is \$0.13 lower than the second quarter average unit price of \$0.66 per cubic yard. Unit



SIZE OF PROJECTS CONSIDERED IN SURVEY

	No. of projects	%	Value of projects	%
Under \$50,000	63	49.6	\$1,292,700	3.5
50,000 to \$100,000	17	13.4	1,268,000	3.5
100,000 to 250,000	28	22.0	4,193,400	11.4
250,000 to 500,000	13	10.2	4,381,100	11.9
500,000 to 1,000,000	3	2.4	1,929,000	5.3
1,000,000 to 2,500,000	1	0.8	2,240,800	6.1
2,500,000 to 5,000,000	1	0.8	4,739,200	12.9
Over 5,000,000	1	0.8	16,641,000 *	45.4
Total	127	100.0	\$36,685,200 *	100.0

* Does not include \$14,238,400 for two contracts Benicia-Martinez Bridge (substructure and superstructure), financed from Toll Bridge bond funds.

bids in projects exercising significant weight in establishing this average price range from \$0.25 to \$0.95 per cubic yard.

Of a total quantity of 5,393,000 cubic yards included in contracts for this quarter, one project in the Sierra Nevada Mountains on U. S. 40 involved 2,740,000 cubic yards at \$0.60. Another project in Sonoma County at Healdsburg required 1,100,000 cubic yards at a price of \$0.39. These two projects practically determined the average unit price for this quarter.

The average price for untreated rock base of \$1.80 per ton is \$0.03 above the second quarter price of \$1.77 per ton. Prices for quantities exercising an influence on the index range from \$1.10 to \$4.50 per ton.

The average unit price for asphaltic and bituminous mixes of \$5.70 per ton dropped \$0.07 from \$5.77 per ton, but is still within the range of average unit prices for the last two years.

The price for portland cement concrete pavement of \$15.54 per cubic yard is an increase of \$1.51 above the previous quarter price of \$14.03 per cubic yard. Only 66,000 cubic yards were involved in the period, half of it on the Sierra Nevada mountain project mentioned above, at a price of \$17.50, and 20,000 cubic yards in the Sonoma County project at a price of \$13.50.

The average unit price for portland cement concrete (structures) of \$58.16 per cubic yard decreased \$7.20 from \$65.36 per cubic yard. This price approximates the average of the last three years for this item.

The price for bar reinforcing steel of \$0.130 per pound is an insignificant

decrease of \$0.004 per pound from the unit price of \$0.134 for the second quarter of 1959. Bid prices for this item ranged from \$0.120 to \$0.300.

The average unit price for structural steel of \$0.237 per pound increased \$0.039 from the second quarter of 1959. A total volume of 27,-

000,000 pounds was used in this quarter, 26,000,000 pounds of it for the superstructure of the Benicia-Martinez Bridge determining the unit price of \$0.237.

An alternate computation was made leaving out the Benicia-Martinez Bridge project, which resulted in an average price of \$0.220.

Cost Index

The California Highway Construction Cost Index, the Engineering-News Record Construction Cost Index, and the United States Bureau of Public Roads Composite Mile Index, all reduced to the base 1940 = 100, are shown on the accompanying graph (Exhibit D). The latter two indexes are based on nationwide construction costs.

The Engineering News-Record Cost Index for the third quarter of 1959,

AVERAGE CONTRACT PRICES

	Roadway excavation ¹ , per cu. yd.	Untreated rock base, per ton	Plant mixed surfacing, per ton	Asphalt concrete pavement, per ton	Asphaltic and bituminous mixes, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar reinforcing steel, per lb.	Structural steel, per lb.
1940	\$0.22	\$1.54	\$2.19	\$2.97	---	\$7.68	\$18.33	\$0.040	\$0.083
1941	0.26	2.31	2.84	3.18	---	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	---	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	---	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.50	---	10.46	31.99	0.054	0.132
1945	0.51	2.42	4.20	4.88	---	10.90	37.20	0.059	0.109
1946	0.41	2.45	4.00	4.68	---	9.48	37.38	0.060	0.092
1947	0.46	2.42	4.32	5.38	---	12.38	48.44	0.080	0.138
1948	0.55	2.43	4.30	5.38	---	13.04	49.86	0.092	0.126
1949	0.49	2.67	4.67	4.64	---	12.28	48.67	0.096	0.117
1950	0.40	2.25	4.26	3.75	---	11.11	43.45	0.079	0.094
1951	0.49	2.62	4.34	5.00	---	12.21	47.22	0.102	0.159
1952	0.56	2.99	5.00	4.38	---	13.42	48.08	0.098	0.150
1953	0.51	2.14	5.31	4.58	---	12.74	50.59	0.093	0.133
1954	0.45	2.13	4.50	4.86	---	14.41	48.42	0.094	0.124
1955	0.39	2.22	4.93	---	---	13.35	45.72	0.095	0.142
1st Quarter 1956	0.40	2.08	5.40	6.50	---	14.05	52.51	0.105	0.166
2d Quarter 1956	0.51	2.06	6.27	---	---	14.64	57.13	0.113	0.219
3d Quarter 1956	0.52	2.27	6.12	---	---	15.57	56.32	0.121	0.178
4th Quarter 1956	0.52	2.21	---	---	\$5.93	14.95	59.63	0.112	0.197
1st Quarter 1957	0.63	2.10	---	---	5.94	17.28	61.14	0.129	0.235
2d Quarter 1957	0.63	2.10	---	---	6.18	15.59	58.61	0.119	0.204
3d Quarter 1957	0.42	2.34	---	---	5.10	14.34	58.68	0.130	0.200
4th Quarter 1957	0.68	1.78	---	---	5.45	16.88	59.76	0.129	0.177
1st Quarter 1958	0.52	1.85	---	---	5.45	14.96	55.21	0.118	0.192
2d Quarter 1958	0.48	1.73	---	---	5.67	13.77	54.44	0.125	0.158
3d Quarter 1958	0.39	2.18	---	---	5.56	13.99	53.93	0.126	0.182
4th Quarter 1958	0.52	2.10	---	---	5.74	13.55	55.20	0.122	0.165
1st Quarter 1959	0.41	1.82	---	---	5.37	14.00	49.40	0.108	0.165
2d Quarter 1959	0.66	1.77	---	---	5.77	14.03	65.36	0.134	0.198
3d Quarter 1959	0.53	1.80	---	---	5.70	15.54	58.16	0.130	0.237

¹ Unclassified.

² The item of crusher run base was used before 1953.

³ Asphalt concrete pavement combined with plant mix surfacing in 4th Quarter 1956, and will be identified as asphaltic and bituminous mixes in the future.

NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUES AND AVERAGE NUMBER OF BIDDERS
(July 1, 1959 to September 30, 1959)

Project Volume	Up to \$50,000	\$50,000 to \$100,000	\$100,000 to \$250,000	\$250,000 to \$500,000	\$500,000 to \$1,000,000	Over \$1,000,000	All Projects
Road projects							
No. of projects.....	58	12	26	13	2		111
Total value*.....	\$1,161,900	\$849,700	\$3,891,400	\$4,381,100	\$1,321,400		\$11,605,500
Avg. No. bidders.....	5.0	6.8	8.8	8.6	12.0		6.6
Structure projects							
No. of projects.....	8	5	2		1	3	19
Total value*.....	\$170,100	\$418,300	\$302,000		\$607,600	\$30,879,500	\$32,377,500
Avg. No. bidders.....	4.5	6.2	10.5		10.0	7.0	6.3
Combination projects							
No. of projects.....						2	2
Total value*.....						\$6,980,000	\$6,980,000
Avg. No. bidders.....						12.0	12.0
Summary							
No. of projects.....	66	17	28	13	3	5	132
Total value*.....	\$1,332,000	\$1,268,000	\$4,193,400	\$4,381,100	\$1,929,000	\$37,859,500	\$50,963,000
Avg. No. bidders.....	5.1	6.6	8.9	8.6	11.3	9.0	6.7

* Bid items only.

Total Average Bidders by Months

	July	Aug.	Sept.	Avg. for three months
1959.....	6.7	6.6	6.7	6.7
1958.....	6.1	6.7	5.2	6.2

which now stands at 334.8, again shows a rise over the preceding quarter. It is up 8.3 index points or 2.5 percent. This index is strongly affected by many large projects outside the highway construction field.

The Bureau of Public Roads Composite Mile Index is based on federal-aid highway construction contracts awarded by the state highway departments. The index for the second quarter of 1959, which is the latest available, dropped 6.3 index points or 2.7 percent from the first quarter of 1959 and now stands at 227.8. According to the Bureau of Public Roads, this sizable drop in the index following a 0.6 percent decrease in the previous quarter does not necessarily indicate a downward trend in highway construction costs. The small fluctuations of the past several years, together with the latest change, appear to indicate continuance of a trend of stabilization in prices.

THE CALIFORNIA HIGHWAY CONSTRUCTION COST INDEX

Year	Cost Index
1940.....	100.0
1941.....	125.0
1942.....	157.5
1943.....	156.4
1944.....	177.8

Year	Cost Index
1945.....	179.5
1946.....	179.7
1947.....	203.3
1948.....	216.6
1949.....	190.7
1950.....	181.2
(1st Quarter 1950—160.6)	
1951.....	225.0
(4th Quarter 1951—245.4)	
1952.....	225.9
1953.....	215.2
1954.....	193.5
(2d Quarter 1954—189.0)	
1955 (1st Quarter).....	189.3
1955 (2d Quarter).....	212.4
1955 (3d Quarter).....	208.6
1955 (4th Quarter).....	212.6
1956 (1st Quarter).....	219.5
1956 (2d Quarter).....	255.9
1956 (3d Quarter).....	249.1
1956 (4th Quarter).....	252.1
1957 (1st Quarter).....	277.7
1957 (2d Quarter).....	266.9
1957 (3d Quarter).....	237.5
1957 (4th Quarter).....	262.1
1958 (1st Quarter).....	241.8
1958 (2d Quarter).....	231.0
1958 (3d Quarter).....	228.5
1958 (4th Quarter).....	238.5
1959 (1st Quarter).....	216.1
1959 (2d Quarter).....	270.4
1959 (3d Quarter).....	260.3

California Engineers In AASHO Posts

Two California highway engineers were honored by the American Association of State Highway Officials at the annual meeting in Boston on October 10-16. State Highway Engineer J. W. Vickrey was elected to a two-year term on the executive committee, the governing board of the association. Deputy State Highway Engineer J. C. Womack was appointed chairman of the Design Committee.

The new AASHO president for 1960 is Dwight H. Stevens, Chairman of the Maine Highway Commission. Kentucky State Highway Engineer D. H. Bray was elected first vice president.

The five-day session was devoted to intensive discussion of national highway problems from the viewpoint of the various states.

Many Road Closures

Numerous forest fires continued to cause many road closures during the last half of October. State Sign Route 27, Topanga Road, from Mulholland Drive to the Pacific Coast Highway in Los Angeles County, was closed by fire for 35 hours between October 15 and 17. State Sign Route 2, in Los Angeles County, was closed from October 13 through the end of the month because of the extensive forest and brush fires raging through the Angeles National Forest during that time.

On the other hand, State Sign Route 79 in Riverside County was closed from 4 p.m. October 1 to 6.15 a.m. October 2 by a flash flood, while State Sign Route 108, Sonora Pass in Tuolumne County, was closed briefly during a snow storm, and dust and wind storms on October 29 and 30 near Mendota in Fresno County and north of Mojave in Kern County necessitated temporary closures in those areas.

Bridge Awards

Two State Spans Cited Among
'Most Beautiful' by A. I. S. C.

TWO CALIFORNIA bridges have been included among those considered as the most beautiful steel bridges opened to traffic during 1958 in the annual competition sponsored by the American Institute of Steel Construction.

The two bridges are the South Fork Eel Bridge at Dyerville on U. S. 101 in Humboldt County which received a first honorable mention in Class II, fixed spans under 400 feet and costing more than \$500,000 and the Marsh Road Overcrossing, on the Bayshore Freeway in Santa Clara County, which received an honorable mention in Class III, spans under 400 feet and costing less than \$500,000.

Both bridges were designed by the Bridge Department of the Division of Highways.

In all, the panel of judges appointed by the AISC selected 13 bridges in 11 states from 104 entries, the largest number of bridges ever submitted in the 31-year-old prize bridge competition.

Top winner in Class I, spans 400 feet long or more, was the new Mackinac Bridge across the Mackinac Straits in Michigan.

The awards for the bridges will be

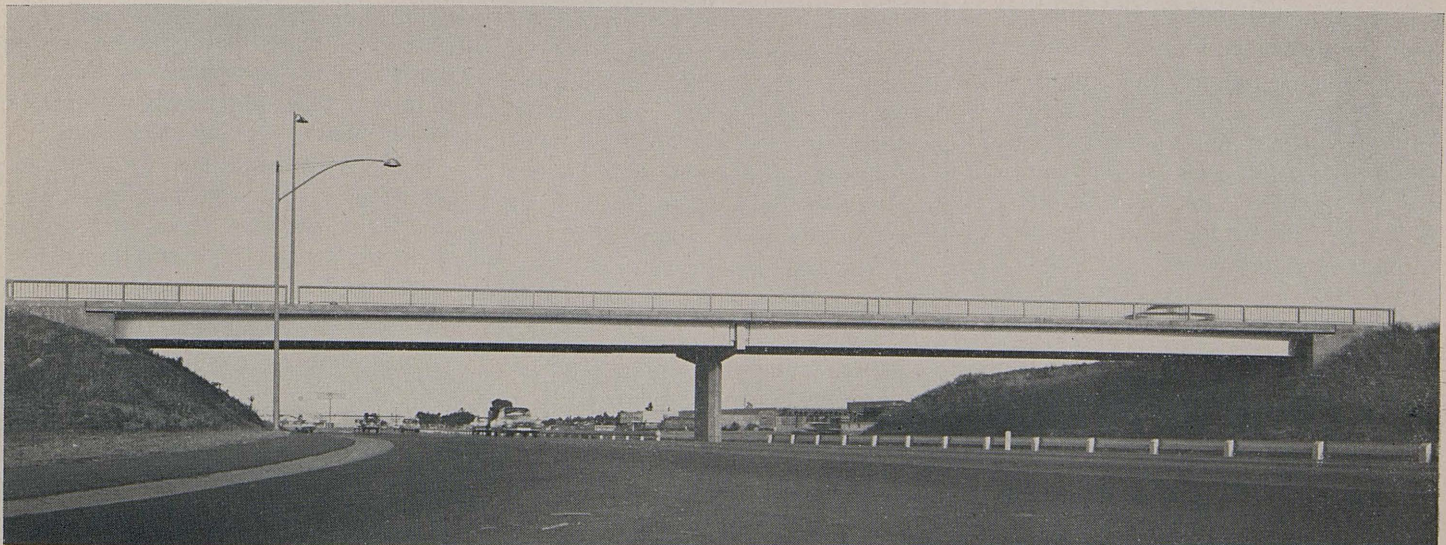
presented in special ceremonies to be arranged at the bridge sites at a later date.

The panel of judges said that a sur-

vey of the entries in the contest showed that "designers were obviously taking a new responsibility for the beauty of bridges and their surroundings."



Winner of the first honorable mention award in the Class II Division for Bridges with spans less than 400 feet long and costing more than \$500,000, was this structure across the South Fork of the Eel River on US 101 near Dyerville in Humboldt County. (Aerial view on page 33.)



Honorable mention winner in the Class III Division for Bridges with spans less than 400 feet long and costing less than \$500,000 was the Marsh Road Overcrossing south of Redwood City on the Bayshore Freeway.

F. A. S. Bridge

New Structure Replaces
Spans Destroyed in Flood

By ELLIS R. DELBON, Road Commissioner, County of Stanislaus

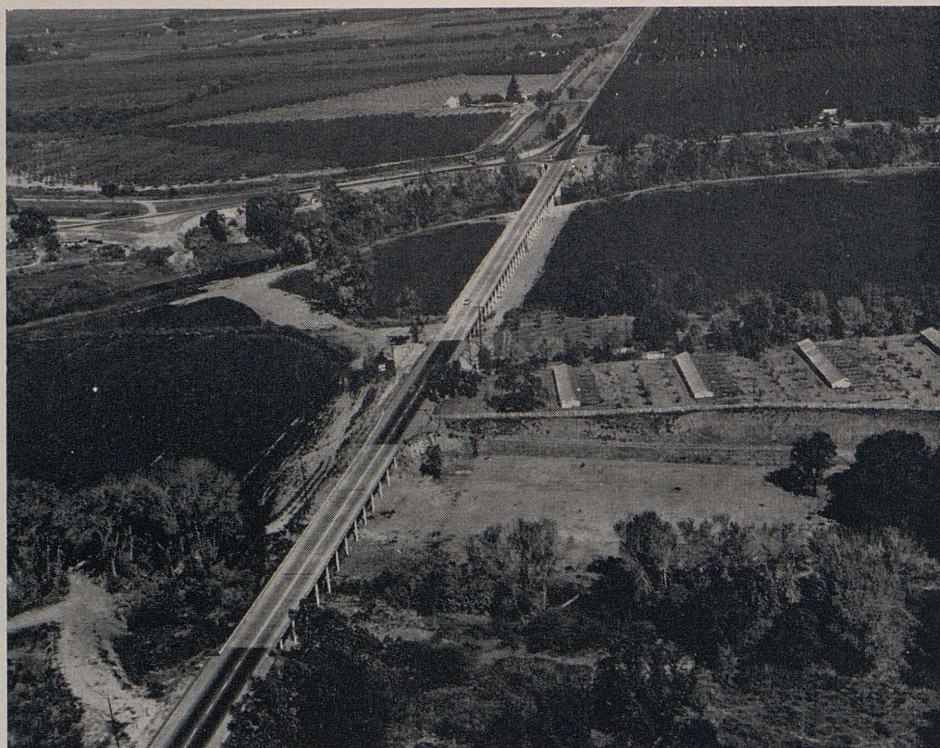
THE NEW Stanislaus River Bridge on Federal-aid Secondary Route 903 was opened to public travel on June 30, during a brief ceremony conducted by Stanislaus and San Joaquin County Boards of Supervisors with more than 200 people in attendance including other county and city officials from both counties.

This modern two-lane structure, 1,136 feet in length, is the largest of two bridges included in the overall F.A.S. project, which extends approximately 1,200 feet into San Joaquin County and 1,800 feet into Stanislaus County. The shorter bridge was constructed over Dry Slough, approximately 300 feet south of the River Bridge.

The old McHenry Bridge was constructed prior to the advent of the motor vehicle 50 years ago. Its 450 feet of timber trestle approach to the two steel truss spans was washed away during the flood in December 1955. Most of the bridge sections were retrieved as the river receded and with a small amount of additional materials the trestle was replaced by county bridge crews and the bridge reopened to traffic in less than three months with traffic restricted to 10 miles per hour and gross load limit of 14 tons.

The importance of this route to many commuters and heavy freight traffic prompted this county to seek funds from all possible sources to finance a modern facility in its place. A \$5,000,000 bridge and highway improvement bond was proposed as a means to finance this project and the reconstruction of several other critically deficient county bridges, and was subsequently approved by the voters in November 1956.

Participating funds from four sources were applied toward construction financing including federal emergency reconstruction funds, as authorized under Section 125, United States Highways Code, Title 23; F. A. S.



A northerly view of County F. A. S. and Flood Relief Project on F. A. S. Route 903 between Modesto and Escalon (in the distance). The old flood-damaged bridge and trestle occupied the diagonal bare area on the left.

funds and local funds by the two counties as indicated on the "Plan Showing Breakdown on Project Financing."

An agreement was executed between the San Joaquin County and Stanislaus County Boards of Supervisors in regard to financial participation, with this county to be responsible for administration and engineering of the entire project.

Of the nine construction bids received, Stolte, Inc., was awarded the contract on the basis of their low bid of \$439,837 and the project was under way in June 1958 under the supervision of Chris Hansen, representing the contractor, and Bob Wright representing the Division of Highways as resident engineer with engineering assistants assigned to the project by Stanislaus County Road Department.

Dry Slough Bridge, consisting of 12 concrete pile bents with 26-foot spans and two end spans of 17 feet, was completed and opened to traffic on October 3, 1958, with a minimum of inconvenience to traffic over the temporary detour maintained by county forces adjacent to the bridge site.

The Stanislaus River Bridge, consisting of 31 concrete pile bents with 26-foot spans and three box girder spans of 100 feet each, was opened to traffic on June 30, 1959, and the project accepted on August 11, when removal of the old river bridge was completed.

These modern two-lane structures provide a 30-foot-wide roadway between railings on a straight alignment, eliminating a dangerous curve which existed on the superseded alignment, where several major traffic accidents have occurred in recent years.

Silverado Trail

*Work Prepares Road
For Future Growth*

By GEORGE R. REINHART, Director of Public Works and Road Commissioner, Napa County

THE Silverado Trail, Federal-aid Secondary Route 607, in Napa County, is one of the two major north-south highways through the famed Napa Valley which extends from the City of Napa to the City of Calistoga. The other route is State Highway 49, Sign Route 29.

This road has great historic significance, particularly as a guide to the development and growth of the Napa Valley and Napa County. Because of its unique physical location it will continue to be one of the key roads in the county road system and will be affected directly by the growth.

The total length of the Silverado Trail as a primary county road is 26.85 miles. For the last 12 years, sections of this route have been reconstructed through the federal-aid secondary road program to provide an improved two-lane facility where there was the greatest need.

Recent Work Cited

The most recent improvement was in the section between Trancas Street, immediately north of the City of

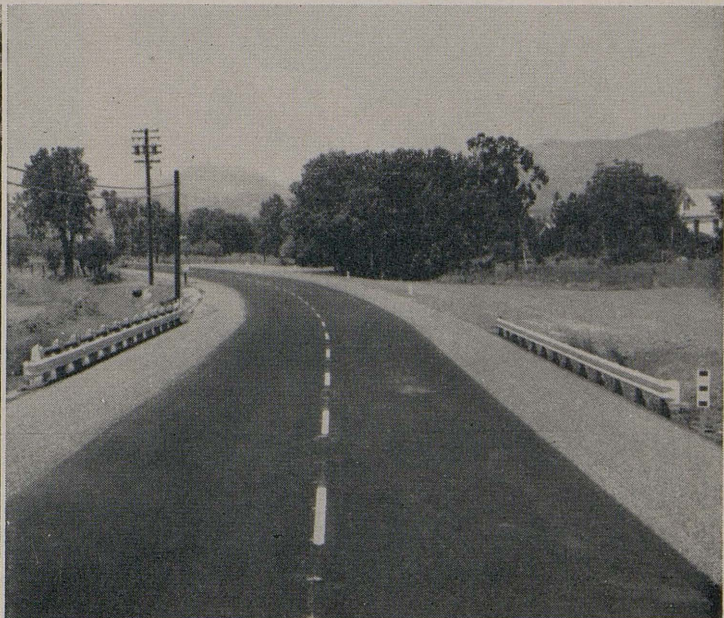
Napa, and Soda Canyon Road, a distance of 2.25 miles. Originally this consisted of a 19-foot graded roadbed with a 16-foot concrete roadway. Throughout a large portion of this section there was no room for traffic to pull off the traveled way.

With an average daily traffic count of approximately 1,200 vehicles, a modern 40-foot roadway providing two traffic lanes of 12-foot each with 8-foot shoulders would serve the traffic needs both now and in the near future, but with the anticipated growth in the areas adjacent to the Silverado Trail and the great increase expected in traffic volume within 20 years, it was felt that provisions for this future need should be incorporated into the current design and construction. A typical section for a four-lane divided highway with an ultimate 10-foot median strip and two roadways of 35 feet each was developed. Each roadway would have two traffic lanes of 12 feet each with an outside shoulder of eight feet and an inside shoulder of three feet.

Interim construction of the 40-foot two-lane would require both shoulders to be eight feet wide, but with the median strip, there would be no encroachment into the area of the future additional roadway. When the other roadway becomes necessary it can be built, and with minor revisions, the roadway constructed now will be incorporated into the ultimate highway.

In conjunction with the construction on the Silverado Trail, it was necessary to improve the Hardiman Avenue connection to the trail by the realignment of approximately 630 feet of Hardiman Avenue and the construction of a reinforced concrete slab bridge 62 feet long to replace a low water crossing.

All of the work in the aforementioned section was completed under two contracts during 1958 and 1959, using federal funds provided by the United States Bureau of Public Roads and state funds provided by the Division of Highways supplemented with county funds aggregating approximately \$300,000.



Before and after construction views of the alignment at one of the bridges on Silverado Trail, Federal-Aid Secondary Route 607. The new alignment provides large radius curves with smaller interior angles and greater sight distances.



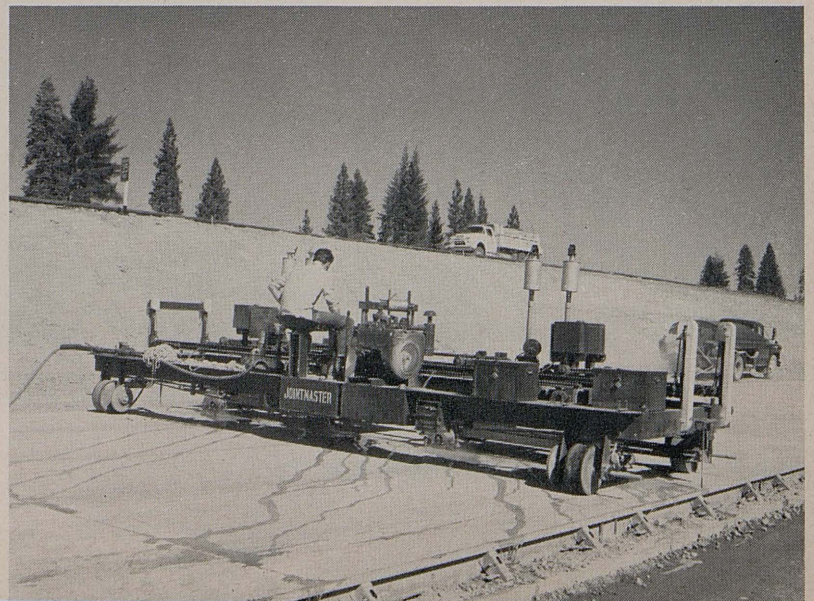
Contractor's crews finishing asphalt shoulder on Hampshire Rocks to Soda Springs section.

Working On U.S. 40

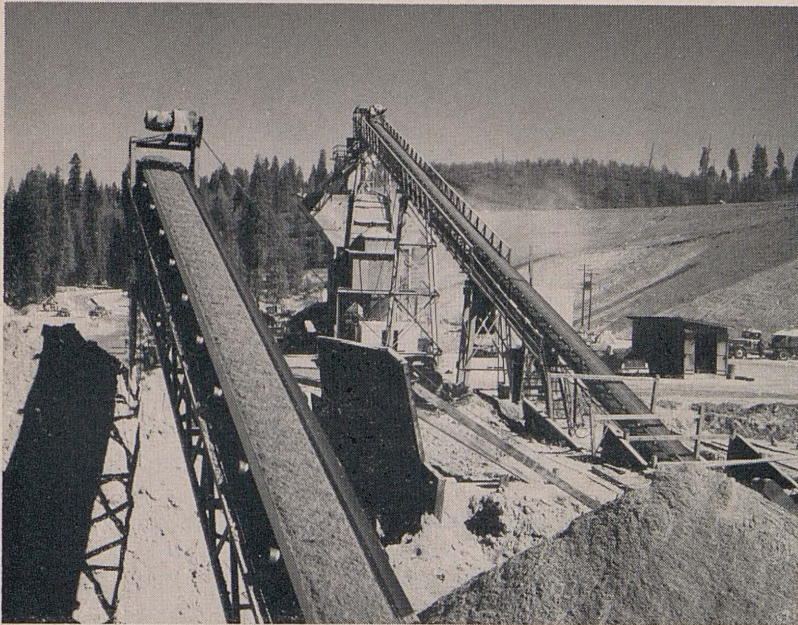


Crew setting guard railing on Boca Bridge approach.

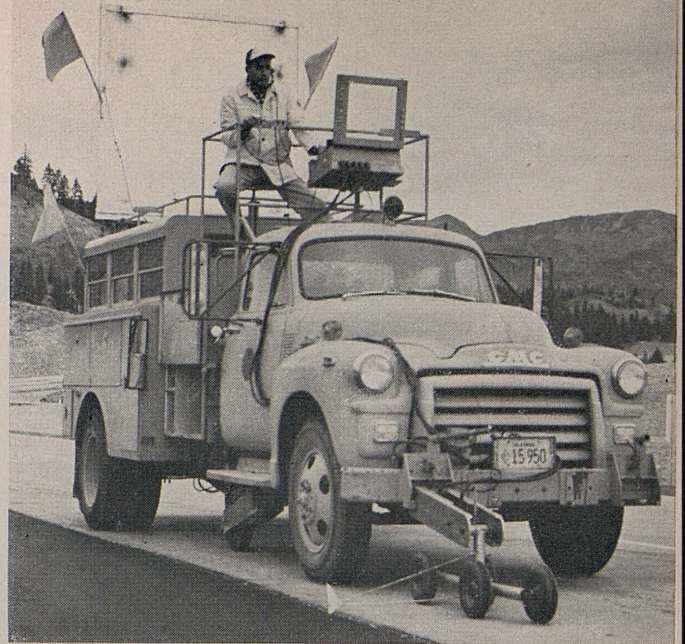
Concrete saw cutting joints in new pavement near Soda Springs. Old highway is on level above.



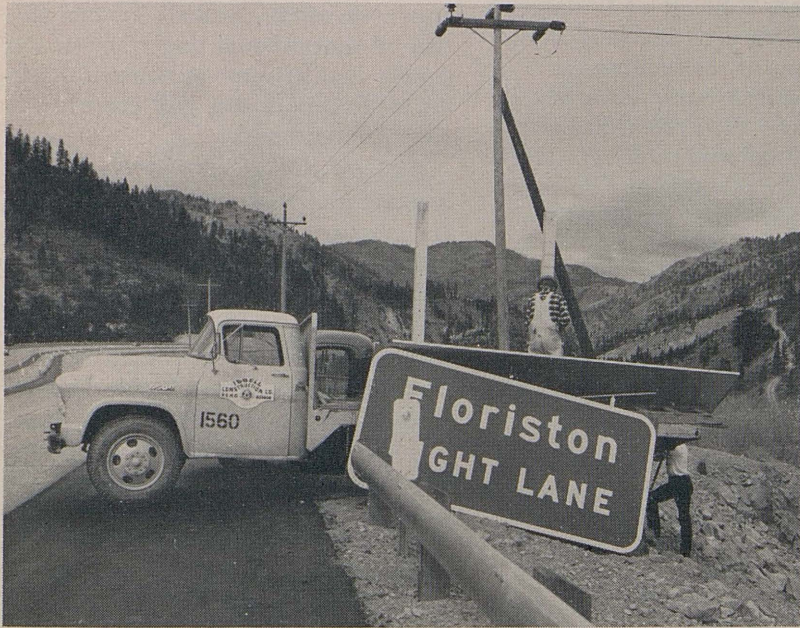
Self-propelled scrapers and bulldozers cutting stabilization trenches near Alta.



Batch plant in operation near Baxter. This is site for new Whitmore Maintenance Station. Old highway extreme left, new route on fill upper right.



Truck-mounted profilograph checking smoothness of paving on completed section near Boca.



Sign-raising crew placing freeway signs on recently opened Truckee Canyon portion.

While Division of Highways Photographer Jack Meyerpeter was making the photographs to illustrate this issue's feature on U. S. 40 (page 2), he made photographs of men and machines working whenever he came upon them.

These are some of his photographs.

They give some idea of the many complex operations which are part of the job of building a modern freeway. The operations are particularly complex when the freeway crosses one of the world's great mountain ranges.

Equipment drying out subgrade on new right-of-way between Monte Vista and Baxter.



November-December, 1959

Marysville Engineer P. R. Lowden Leaves

Perry R. Lowden, Assistant District Engineer of the Marysville District, California Division of Highways, retired November 1 after more than 34 years with the State and a lifetime of highway engineering and construction in California and Nevada.

Born in Weaverville, Trinity County, Lowden attended grade school in French Gulch, Shasta County, and was graduated from Redding Union High School.



PERRY R. LOWDEN

He joined the Division of Highways in 1916 as a teamster and roddman at Dunsmuir. After spending 1918 in France with the U.S. Army, Corps of Engineers, he returned to the Division of Highways at Dunsmuir as a transitman.

From 1920 until 1928 Lowden left state service to work on several highway engineering and construction jobs in California and Nevada.

He returned to the California Division of Highways in 1928 and was assigned to the Redding district where he worked on location, design and construction. In 1937 he transferred to the headquarters office in Sacramento as assistant construction engineer. From 1938 until 1950, when he was appointed to his present position, he worked out of Sacramento as field representative for the Surveys and Plans Department.

Lowden lives with his wife Margaret at 770 Jewell Avenue, Yuba City. They have three children and six grandchildren. His son, Perry, Jr., is an assistant highway engineer in the Design Department of the Marysville office.

A registered civil engineer, Lowden is a member of the Elks and E Clampus Vitus.

Retirement plans include time for his favorite sports of trout fishing, hunting ducks and deer, and touring with his small house trailer.

FREEWAY BENEFITS CITED AT TRAFFIC CONFERENCE

The safety benefits of modern freeways, such as those being constructed in California, were emphasized by publisher William Randolph Hearst, Jr., and by other speakers at the Tenth Annual Governor's Traffic Safety Conference October 7-9 in Sacramento.

The conference was attended by some 1,500 delegates including traffic engineers, educators, law enforcement officers, safety experts, public officials and private citizens from throughout the State.

Purpose of the annual conference is to examine ideas and methods for reducing the accident toll on California's streets, roads and highways.

Hearst, chairman of the President's committee for traffic safety, and Governor Abraham Ribicoff of Connecticut were the featured speakers at the general sessions of the conference.

Speaking at the conference luncheon, Hearst said the present programs of highway modernization and freeway construction, both in California and throughout the nation, should continue without delay.

"A considerable amount of safety is being put into these new roadways," he said. "We have learned that such engineering measures as controlling access, dividing opposing streams of traffic, and eliminating crossings at grade, pay off in lives saved and accidents prevented as well as greater freedom of movement," he declared.

Citing figures prepared for Congress by the National Safety Council, Hearst said that the controlled-access freeways already in use throughout the country "are reducing traffic deaths 700 a year below what they would be without those highways."

Hearst also spoke of California's position of leadership in highway planning matters in the United States.

"It is my understanding," he said, "that your Legislature already has enacted legislation, sponsored by Senator Randolph Collier, that spells out the first long-range master plan for modern highways to be adopted by any of the states."

Discussing future increases in motor vehicle traffic in the United States,

Hearst said that "during the next 18 years we are going to see more vehicle-miles of travel in this country than we have seen so far in the 59 years of this century" including the horse-drawn mileage of earlier days. Hearst said preparations should be made now for meeting the traffic problems of the future.

"It is gratifying to me to learn that in this area, too, California is leading the way," he said. "It is my information that you already have at work a legislative study, under the chairmanship of Assemblyman Lee M. Backstrand, looking into the long-range problems of motor vehicle use.

"The idea for your specific study has the support of the business advisory panel of the President's committee for traffic safety. And the general idea that all states should undertake similar studies also has our enthusiastic backing and support and will continue to have," Hearst said.

Ribicoff spoke at the conference banquet and told delegates how strict enforcement practices and stiff penalties for traffic violators have reduced the accident rate in Connecticut.

State Director of Public Works Robert B. Bradford joined Robert McCarthy, director of the Department of Motor Vehicles, and Bradford M. Crittenden, California Highway Patrol Commissioner, in speaking before the commercial vehicle division of the conference.

"Here in California last year," Bradford reported, "motor vehicle travel amounted to 65 billion miles and took the lives of more than 3,500 citizens. Twenty years from now, in 1980, Californians will drive an estimated 200 billion vehicle-miles. This is an increase of over 300 percent.

"This means that we face the stark possibility of more than 10,500 traffic deaths in 1980—unless we can alter the present tragic ratio between miles of travel and fatal accidents.

"Fortunately, in the records on freeway travel we find evidence that the rate of fatalities per mile of travel can be reduced.

... Continued on page 56

Report From District I

By SAM HELWER, District Engineer



A portion of the completed first unit of the Redwood Parks Freeway on U. S. Highway 101 north of Dyerville at High Rock Road Undercrossing.

CORRECTION and improvement of critical deficiencies in the District I Counties of Lake, Mendocino, Humboldt, Del Norte and portions of Trinity and Siskiyou reached an unprecedented level since our last report presented in the July-August 1958 edition of this magazine, affording further safety, comfort, convenience and reduction in driving time for the motorist.

Since our last report, 57 projects were completed or started, not including small projects constructed under minor contract procedure. The projects range in scope from major freeway and bridge construction to culvert replacements and minor improvements.

The development of the Redwood Highway to a four-lane freeway continues to be among the prime interests of the area. This is readily understandable because as various units of new freeway are completed there is an increasing awareness of the travel ease afforded by the new sections of freeway as compared to the old and obsolete sections of two-lane highway.

U. S. 101 North

As we tour north along the Redwood Highway, U. S. 101 and U. S.

199, we will see the major improvements completed and under way.

An interim improvement was completed in October 1959 on U. S. 101 in Mendocino County, between 1.3 miles south of Robinson Creek and Smith Street in Ukiah, for a project length of five miles. This project, although to be eventually superseded by a freeway around Ukiah, will, during the interim, provide a better highway and street facility and relieve traffic congestion on State Street (U. S. 101) in Ukiah. The project involved the strengthening of the pavement structure and resurfacing. On a portion of State Street within the City of Ukiah, the roadway was widened by moving back the curbs.

The City of Ukiah participated in the cost of that portion of the work involved in the widening of State Street. The completion of the project resulted in a four-lane street section for the total length of State Street (U. S. 101) in Ukiah. The work was performed by Granite Construction Company, of Watsonville, at a cost of about \$473,000.

Another interim project at the of project under construction be included in the 1960-61 budget. Studies are being carried on for the eventual freeway around Willits, but

a series of curves on the present route from the north city limits to 1.6 miles northerly have reached a high degree of obsolescence. The sum of \$175,000 is included in the new budget, providing for grading and paving to ease curves.

From 7½ miles north of Willits, northerly through Long Valley Creek Canyon, four-lane freeway construction is still progressing. In the last report we told of work nearing completion on a 4.2-mile length of improvement from Hilvilla to Irvine Lodge. This has subsequently been completed so with a previously completed project there is now a 6.2-mile stretch of four-lane freeway completed. This is a neat improvement over the obsolete section of two-lane highway that it replaced. This completed improvement is now being extended northerly by a five-mile length of project under construction between Irvine Lodge and Old Sherwood Road, about 4½ miles south of Laytonville. This work is being done by Granite Construction Company of Watsonville at an approximate cost of \$2,411,000. Upon completion of the current construction there will be a continuous length of four-lane freeway, for 11 miles, from Reeves Creek to Old Sherwood Road, eliminating

entirely the old and particularly deficient section of highway for the full length of Long Valley Creek Canyon.

Old Section Replaced

As we proceed north to old Farmhouse Inn, about 12 miles north of Laytonville, we find that another obsolete section of old Redwood Highway has been replaced by a 2.8-mile length of four-lane freeway extending from Farmhouse Inn to just north of Tan Oak Park, which was completed in August.

This new four-lane freeway replaces another section of obsolete highway with its sharp curvature and narrow roadbed. The old highway created particularly bad winter driving when icy conditions persisted in

the narrow and shady canyon of Rattlesnake Creek.

Work on this project was actually started in 1956 when a tunnel was constructed through a rock promontory at Tan Oak Park to divert the course at Rattlesnake Creek where the new highway embankment infringes on the original creek channel. This 136-foot-long tunnel was constructed by Mercer-Fraser Company of Eureka at a cost of \$39,000.

The second contract, which completed the project was with Ball and Simpson of Berkeley, California, and involved an expenditure of approximately \$2,134,000.

The freeway, constructed in a narrow canyon also containing the meandering course of Rattlesnake Creek

and the old highway, posed particular highway design and construction problems. A prime problem was the handling of traffic with a minimum of delay during construction. The narrow confines of the canyon did not permit construction of practical detours. The specifications permitted periodic closure of the highway for four-hour periods during the night for a period of 50 consecutive days in order that desirable construction progress could be maintained. The contractors, Ball and Simpson, did not elect to take advantage of permissible closures and are to be commended for their efficiency and techniques which resulted in traffic going through at all times with minimum delays.



A cleared area prior to grading operations on the second unit of the Redwood Parks Freeway (US 101) between Myers and Dyerville in Humboldt County.

The project involved clearing of 75 acres of land and moving of 900,000 cubic yards of dirt and rock.

Channel Is Changed

To keep Rattlesnake Creek flowing freely, channel changes were necessary and new embankments were protected from erosive currents by 5,900 tons of rock slope protection.

The roadway is a 60-foot-wide all-paved section providing four 12-foot driving lanes, 4-foot division strip and 4-foot shoulders.

The next big freeway project we observe as we proceed northerly is the second unit of the Redwood Parks Freeway in Humboldt County. It extends for 7.5 miles from Myers to just south of Dyerville, connecting with the completed 4.4-mile-long first unit. Three contracts are involved in this second unit with two contracts completed and at this writing good progress is being made on the third contract, which will complete the project.

The first contract provided for the clearing of the area between slope boundaries which amounted to 167 acres.

The area cleared contained a considerable volume of salable timber of various species and of course large redwoods. This timber became the property of the contractor and the timber was sold by him to lumber mills. Under such circumstances the project was a combination logging and clearing operation.

Crosses Park Lands

The logging, however, had to be carried on in a somewhat different manner than usual. The greater portion of the project traverses state park lands and all clearing and logging operations had to be confined within the clearing flags so that all natural growth and trees outside the flags would not be damaged or disturbed in any manner whatsoever. It is therefore obvious that the trees could not always be felled in the most desirable direction or manner.

This clearing work was performed by Don F. Shuster of Willits, California, at a cost of \$250,844.

The second contract, on this second unit of the Redwood Parks Free-



A view southward showing the new George M. Leatherwood Memorial Bridge on the recently completed first unit of the Redwood Parks Freeway (US 101) at Dyerville in Humboldt County. The old highway bridge can be seen to the left of the new one. (See photo on page 25.)

way, provided for the construction of a reinforced concrete arch culvert at Mowry Creek, a short distance north of Myers.

The arch culvert is 514 feet long with a seven-foot arch. The contractor was John W. J. Petersen, Inc., of Loleta, who performed the work at a cost of \$125,600. The work was expedited and an excellent quality

structure produced by use of contractor devised, prefabricated steel forms.

The third contract to complete this second unit is now under way. The contract is with Morrison-Knudsen Company on the basis of their low bid of \$4,912,329.

The project length is 7½ miles and connects with the completed first unit



The completed first unit of the Redwood Parks Freeway (US 101). This view is southward from above Englewood. The area on the right above the highway is logged off. To the left and below the freeway are virgin redwood groves of State Redwood Park. In the far left is the Eel River.

at Dyerville. Upon completion of the second unit in 1960, there will then be 11 miles of continuous Redwood Parks Freeway.

The work on this third contract consists in general of constructing graded roadbeds, drainage structures, placing plant-mixed surfacing on untreated base and cement treated base over imported subbase material and constructing roadway lighting systems. Four major structures will also be built, being Williford Road Undercrossing, Pesula Road Overcrossing, Weott Undercrossing and Women's Grove Overcrossing. As is usual in District I, there is considerable stabilization work to be done prior to the placing of embankments.

First Unit Completed

In our last report, the first unit of the Redwood Parks Freeway from Dyerville to Englewood was still under construction. It was completed and opened to traffic in the afternoon of October 27, 1958, after appropriate opening ceremonies and dedication of the George M. Leatherwood Memorial Bridge. The program was sponsored by the Humboldt County Board of Trade and the Greater Eureka Chamber of Commerce with numerous dignitaries, state and county officials participating.

The first unit as a forerunner of the eventual 43-mile length of Redwood Parks Freeway results in a startling comparison of the old and the new. Its 4.4-mile length of four-lane free-

way replaced a section of original two-lane highway that was critically deficient in all aspects. The old section contained High Rock Hill and Englewood Hill and any appreciable volume of mixed traffic continuously created congestion and delays.

It is anticipated that progress on the 43-mile Redwood Parks Freeway will be continuous until completion. Detailed design work is under way on the third unit extending 11 miles from Sylvandale to Myers in Humboldt County. The location of this unit is across the South Fork of the Eel River from the existing highway in virtually virgin territory at least as far as major highway construction is concerned. The area to be traversed is now served only partially by a county road and logging roads. In order to get drill rigs in for foundation investigations, roads had to be specially constructed in some areas.

In all probability the third unit will be constructed in three phases due to the extent of work necessary and costs involved. The recently adopted 1960-61 State Highway Budget includes an allocation of \$1,915,000 for a bridge and approaches at Myers Flat.

Leaving the Redwood Parks Freeway and proceeding north, the next major project, now under way, is the construction of a parallel bridge across the Eel River, about three miles south of Scotia, usually referred to as South Scotia Bridge. The original bridge at the crossing, constructed in 1916, although structurally sound, is seriously deficient in roadway width. It has long been posted as one-way with reduced speed for large trucks and buses.

Parallel Bridge Needed

The project's main purpose is to supplement the existing narrow bridge with a modern parallel structure to relieve the bottleneck of the narrow structure. The existing structure will serve northbound traffic and the new parallel structure will carry the southbound lanes.

The total length of project is seven-tenths of a mile which includes minimum four-lane approaches transitioning to the relatively good two-lane highway at each end of project.

The work is well advanced on the approach and substructure of the



A recent improvement made US 101 through Crescent City in Del Norte County a one-way couplet with four-lane approaches. This southwest view shows the US 101-Northcrest Drive intersection in the right center.

bridge. The new bridge, a combination river crossing and an overhead across the tracks of the Northwestern Pacific Railroad, will be 998 feet long consisting of two steel truss spans and six welded plate girder spans supported on concrete piers and abutments on concrete and steel pile foun-

dations and spread footings providing a clear roadway width of 28 feet.

The contract on this project is with Erickson, Phillips and Weisberg and Arthur B. Siri, Inc., on the basis of their low bid of \$984,227.

In the district's densest traffic area, the Humboldt Bay area, progress in

freeway construction is being maintained.

On October 30, 1959, traffic was routed onto a new section of freeway between the northerly city limits of Fortuna and 0.4 mile north of Fernbridge.



A recently completed freeway section on US 101 between Patricks Point and Big Lagoon in Humboldt County. This northward view shows the embankment across Big Lagoon which replaced the former timber trestle.

New Section Opened

This new section of four-lane divided freeway is 3.2 miles long and connects with the southerly end of the four-lane divided expressway over Table Bluff Hill that was opened to traffic last year. Together these two sections north of Fortuna give the motorists a 7.6-mile section of modern, four-lane divided freeway.

The Fortuna-Fernbridge section was built under two separate contracts, the first of which was started in April of 1957. The first contract, totaling \$480,300, was completed by Mercer-Fraser Company in May of 1958, and provided three grade separation structures and their approaches. The second contract for grading, surfacing, and other necessary miscellaneous items was completed by the Norman I. Fadel Company at a total cost of \$1,278,000. The freeway has four 12-foot traffic lanes, paved shoulders eight feet wide and a 22-foot wide division strip. The Fortuna area will see further activity on development of U. S. 101 to a freeway. The 1960-61 budget provides \$910,000 for

structures on a 3.9-mile section of freeway between 0.4 mile north of Alton and northerly city limits of Fortuna. This 3.9-mile section will fill the gap between completed sections of freeway, Robinson Ferry Bridge to Alton, and Fortuna to Hookton Road.

There is considerable interest in this dense traffic area to complete the freeway to Eureka at Elk River, just south of the southerly Eureka city limits. Toward this end, plans are completed and the new budget provides \$2,590,000 to extend the freeway from the northerly end of the completed freeway over Table Bluff Hill at Hookton Road to just south of Fields Landing, a distance of 3.7 miles. Design work is under way on the balance of 2.7 miles from Fields Landing to Elk River.

From Eureka northerly and through Arcata, there is now 10 miles of continuous freeway. This resulted from the recent completion of a section extending the Eureka-Arcata freeway northerly from the U. S. 101-299 intersection to the intersection of U. S. 101 and Northbank Mad River Road.

This 1.5-mile project was constructed under two contracts. The first contract was completed by Mercer-Fraser Company of Eureka at a cost of \$475,000 and provided a parallel bridge and approaches at Mad River. This new bridge will accommodate southbound traffic.

The work on the second contract was performed by Mercer-Fraser Company on their low bid of \$801,717. This contract which completed the project, grading and surfacing, also provided for the replacement of the old trestle to the old Mad River Bridge with steel and concrete approaches.

The most northerly of the major freeway projects under construction at this time, is the current construction of a four-lane freeway between Little River and Trinidad, a distance, by new freeway, of 3.7 miles.

All work to complete the project is being done under one contract. Work is covered by 90 contract items from clearing 97 acres, moving 1,200,000 cubic yards of roadway excavation, to providing highway illumination.

Three major structures are included in the work. These are Moonstone Road Undercrossing, Sixth Street Overcrossing and Trinidad Road Undercrossing. This new freeway will supersede another section of originally constructed highway which is now obsolete. Narrow roadbed, sharp and continuous curvature and undulating grade are the characteristics of the old section, together with maintenance problems of slides and slipouts in unstable terrain along the ocean shore.

Crosses Rugged Terrain

The new freeway traverses rugged country cut with deep ravines and is inland for varying distances from the existing highway. Heavy and difficult clearing featured the preliminary work. The terrain traversed was to a great extent cut-over redwood land and therefore numerous large redwood stumps were involved in the

clearing operations. These always pose problems in removal and disposal.

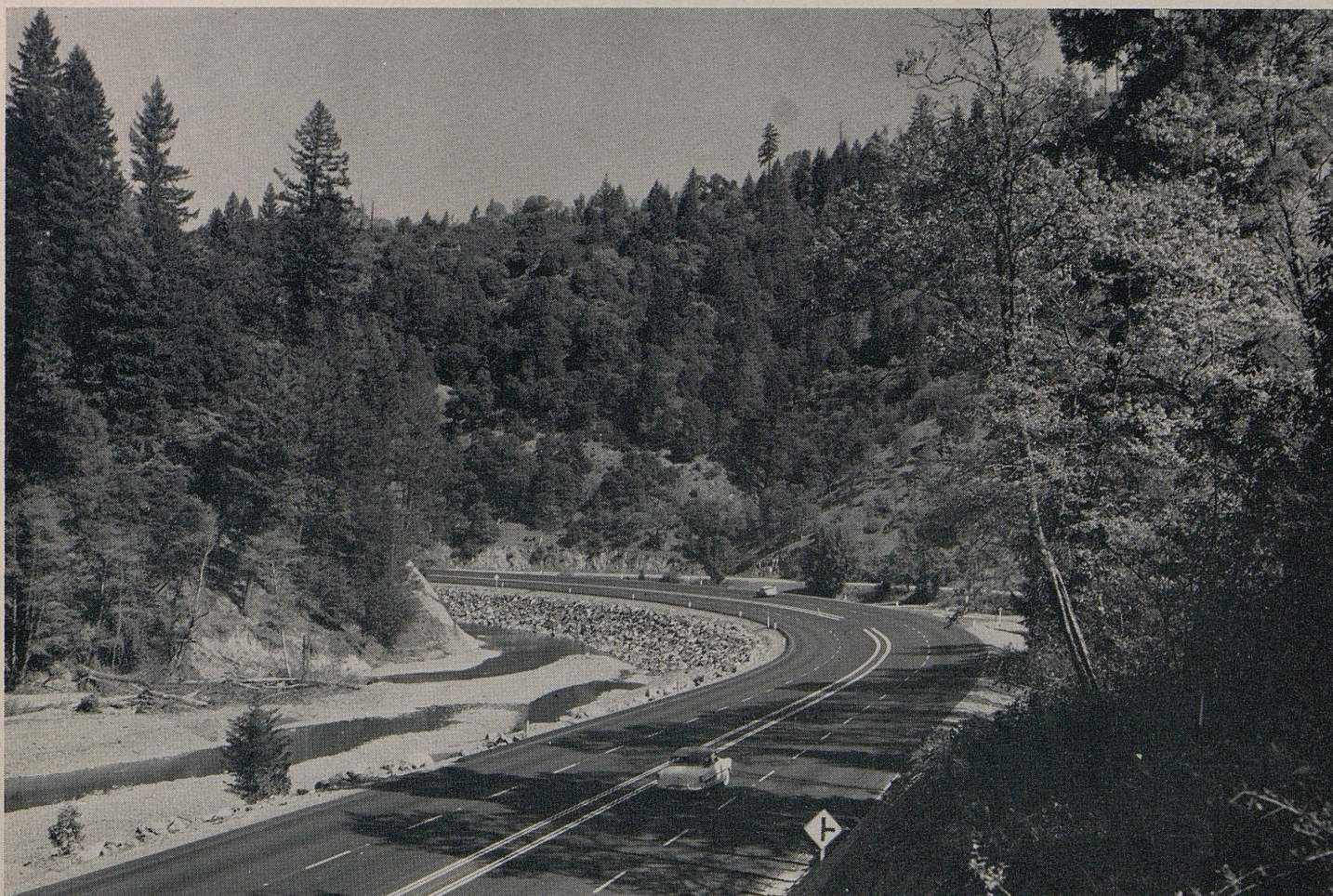
The contracting firm, which is making good progress while the sun shines, is John Delphia, Fred J. Early, Jr., & Company, and L. A. & R. S. Crow. Their low bid was \$2,288,888.

The motorists in the extreme northern end of the district are also gaining the benefits of freeways and multilane facilities which are replacing old two-lane roadways. In the last report we told of work progressing on the Patricks Point-Big Lagoon Freeway which eliminated the old 4,000 feet long Big Lagoon trestle. The 3.6-mile length of freeway was officially completed on June 25, 1959. It was constructed under two contracts with Norman I. Fadel Company completing the first contract consisting of clearing and grading and Mercer-Fraser Company performing the bridge construction and surfacing as

a second contract. The total cost of the project was \$1,835,000.

Another multilane facility in the north end of the district was also completed since the last report. This was the one-way couplet on U. S. 101 through Crescent City with four-lane pavement at the southerly and northerly entrances to the city. All work on this project was completed on February 26, 1959, at a cost of \$578,000.

An interesting project is developing on U. S. 199 in Del Norte County in the Hazelview Summit area. A complete relocation of U. S. 199 in the area is involved, which includes a tunnel, reducing summit climb, greatly improving alignment and reducing distance. Work will get under way at an early date as the 1960-61 budget allocates \$770,000 for the grading at the north approach to the tunnel from 2.5 to 1.1 miles south of the Oregon line.



A new section of freeway on US 101 about 10 miles north of Willits in Long Valley Creek Canyon in Mendocino County.



Looking north along the construction of the freeway on US 101 between Fortuna and one mile north of Fernbridge in Humboldt County.

Lake County Improvements

In Lake County the rehabilitation and reconstruction of state highways has been continuous, affording driving ease and better service to the area.

The 6.3-mile two-lane expressway on Sign Route 53 between Cache Creek and Sign Route 20 which was mentioned in our last report has subsequently been completed.

An exceedingly obsolete section of highway in Lake County on Sign Route 29 was superseded by a project completed in October.

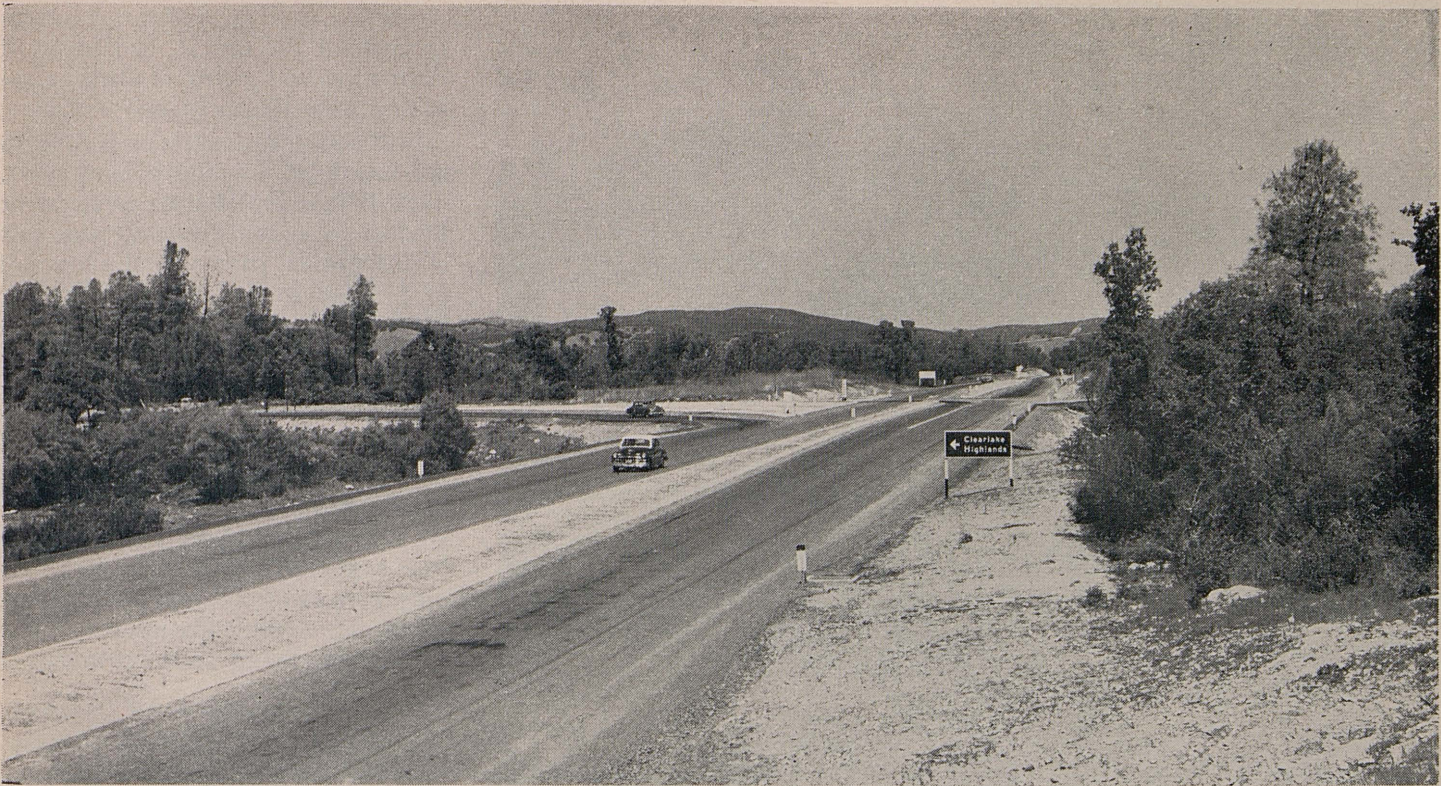
The improvement extends for four miles from Lower Lake Road at the foot of Cobb Mountain to Kelseyville. Long tangents, easy curves and grades superseded the old kinky curvature combined with grades and narrow roadbed. The work was carried on in an excellent manner and at a rapid pace by the Baun Construction Company of Fresno at a cost of about \$366,000.

The complete improvement by relocation, reconstruction and/or resurfacing of Sign Route 20 through Lake County continuous to the Mendocino County intersection with U. S. 101 resulted when a portion of the route in Lake County was resurfaced this summer. The resurfacing was applied for a distance of 14½ miles from junction with Sign Route 53 easterly to Lake-Colusa county line.

Further improvements of Sign Route 53 from foot of St. Helena grade to Middletown will be undertaken at an early date. A 4.2-mile project is allocated \$625,000 in the 1960-61 budget for construction of a two-lane freeway between St. Helena Creek and Middletown. Design work is also underway, on what will probably be the last gap in the total improvement of Sign Route 53 within Lake County. This is a section 4.3 miles in length between Harris Creek and Lower Lake.

Sign Route 1

On the Shoreline Highway, Sign Route 1, along the Mendocino coast the replacement of substandard bridges has continued to feature the improvement program. This has been a continuing effort since the route was included in the state highway system in 1933.



This northward view at Clearlake Highlands Road in Lake County shows a portion of the new Sign Route 53 relocation between Cache Creek and the Sign Route 20 intersection.

During the year two major structures were completed. The Gualala River Bridge project at the Sonoma-Mendocino county line was completed, at a cost of \$570,000. The construction of the 584-foot-long structure with approaches resulted in a new facility one mile long replacing an old timber structure with very substandard approaches. The work was done by Peter Kiewit & Sons.

A departure from the numerous bridge replacement projects on Sign Route 1 along the Mendocino coast will take place next year. The narrow highway along the precipitous ocean bluffs just south of Navarro River, will be replaced by a 1.5-mile relocation. The 1960-61 Budget provides \$410,000 for the work.

The budget also provides \$735,000 for construction of a new bridge and approaches at Big River, just south of Mendocino, on Sign Route 1. The existing Big River Bridge is one of the old original bridges on the route; which structure has had major repairs several times and has reached a stage beyond further repair.

In September of 1958, a contract was awarded to Bos Construction

Company of Berkeley on the basis of their low bid of \$295,664 for construction of a new bridge and approaches at Pudding Creek at north city limits of Fort Bragg. The work on this project was completed in July of 1959.

The old 572-foot-long timber trestle structure was replaced by a reinforced concrete bridge 321 feet long. The bridge consists of eight precast prestressed concrete deck unit spans supported on reinforced concrete pile bents and concrete abutments. The new structure with approaches made a project 0.6 mile long.

Other smaller deficient bridges on the route also received attention. On Wages Creek Bridge, 17 miles north of Fort Bragg, a new concrete deck was constructed at a cost of \$9,000.

One project consisted of the replacement of old deficient culverts at 20 locations and another replaced an old log culvert at Dunn Creek with a field-assembled plate culvert.

Other projects sometimes considered minor but yet contributing to the overall improvement to the route have been completed or are underway. Two old cattlepasses in the vi-

cinity of Albion were replaced by modern structures.

In an endeavor to bring all appurtenances up to state highway standards on the section between Westport and Leggett Valley two culvert projects are underway. One project is replacing old deficient culverts at 20 locations and another replaces an old log culvert at Dunn Creek with a field-assembled plate culvert.

U. S. 299

On U. S. 299 the major activity is a continuing effort on the improvement of this route by the Honor Camp 42 forces.

Work is now progressing in the Green Point area. The work generally involved a major relocation of the route between North Fork Mad River and Berry Summit.

Grade has been completed with select material placed on a relocation between Preston Ranch, the location of Honor Camp 42, and intersection of relocation with existing 299 at Lord-Ellis Summit, a distance of one mile. This new grade is not yet in use by regular traffic, but serves as access to Camp 42.



A southward view of the Sign Route 53 relocation in Lake County showing the south end of Clear Lake in the background.

Grading on a portion generally crisscrossing the existing highway has for the larger part been completed from Lord-Ellis Summit easterly to Green Point, a distance of 2½ miles. A greater portion of the new grade has been bituminous treated and is in use by U. S. 299 traffic.

From Berry Summit to Willow Creek a series of contracts by the United States Bureau of Public Roads, as a forest highway improvement, completely modernized the section of highway. Work was completed in the late summer of 1958 by replacement of plant-mixed surfacing.

Sign Route 36

The portion of Sign Route 36 within District I, being from Alton to Peanut, was improved to a large extent by the reshaping of the roadbed and

the application of a bituminous penetration treatment from Butte Creek to Peanut, a distance of 37 miles. This work was accomplished at a cost of \$70,500. This project resulted in oil surface on the total length of the route within District I.

A project 1.2 miles west of Bridgeville, with a project length of 0.6 mile, eliminated a particularly deficient section of highway. The project involved grading and surfacing to modernize grade and line. Work was done by Marlin Tryon of Fort Dick at a cost of \$90,000.

In addition to the construction program carried on during the past year there were seven storm damage repair projects completed with the improvement program.

The projects involved an expenditure of approximately \$1,500,000. The

projects were at various locations throughout the district and involved restoration and repair of damage resulting from the early 1958 storms.

Further improvements on S. S. R. 36 are scheduled for the coming year. Two bridge replacement projects at Little Larabee and Butte Creeks, east of Bridgeville, have a total allocation of \$137,000 in the 1960-61 Highway Construction Budget. From 9.6 miles to 11.1 miles east of Bridgeville, a 0.4-mile-long project will result in realignment and construction of two cattle-passes. The sum of \$65,000 is included in the new budget for that project.

U. S. 101, 299 and Sign Routes 20, 36, 128 and Bull Creek Park Road all had restoration projects which not only restored roadways and appurtenances, but generally insures against further damage by future storms.

Other Work Listed

The major projects tend to overshadow the numerous smaller projects, both in scope and expenditure, yet these smaller projects individually and in aggregate result in noticeable improvement and better service and efficiency.

We might mention some of the projects in this category.

On U. S. 101 in the Laytonville area, four reinforced concrete box culverts are being extended to eliminate roadway width restriction and permit a continuous desirable shoulder width.

On the first unit of the Redwood Parks Freeway on U. S. 101 at the Dyerville interchange highway lighting was installed greatly adding to the safety, comfort and convenience of night driving.

On U. S. 101 at the northerly end of the Pepperwood tangent a sudden sharp curve with restricted roadway width due to adjacent large redwood trees was eliminated by removal of several trees, easing curve, and widening.

On the southerly end of the freeway over Table Bluff at intersection of the old highway to Loleta, highway lighting was installed to facilitate nighttime traffic movements.

At the intersection of U. S. 101 and U. S. 299 just north of Arcata a proj-

... Continued on page 56

Recent Retirements From Division of Highways

Headquarters

Elrod R. Bradt, Assistant Highway Engineer, 30 years; George T. McCoy, State Highway Engineer, 32 years; Wm. C. McNeely, Assistant Highway Engineer, 45 years.

District I

Adolphus Boyd, Skilled Laborer, 25 years; George Dawe, Laborer, 9 years; Fred Trimble, Laborer, 25 years; Dora F. Stull, Intermediate Clerk, 6 years.

District II

Percy C. Crawford, Highway Equipment Operator-Laborer, 25 years; Ambrose J. Dooley, Laborer, 28 years; Cyril Gould, Highway Equipment Operator-Laborer, 26 years; James R. Owens, Laborer, 21 years.

District III

Ralph C. Abernathy, Laborer, 22 years; Walter M. Barnes, Highway Foreman, 36 years; Walter J. Butz, Highway Foreman, 40 years; Isaac Cormier, Laborer, 29 years; Marvin R. Miller, Assistant Highway Engineer, 26 years; Clyde W. Rust, Highway Superintendent, 43 years; Malion P. Wallace, Highway Equipment Operator-Laborer, 26 years; Frank E. Wilson, Senior Highway Engineer, 31 years.

District IV

Sterling Cloughley, Administrative Assistant, 15 years; Patrick A. Devine, Assistant Highway Engineer, 3 years; Herman E. Grosser, Highway Foreman, 37 years; August J. Handman, Laborer, 4 years; Warren McCullen, Highway Equipment Operator-Laborer, 22 years; George W. Otto, Highway Equipment Operator-Laborer, 26 years; George L. Vann, Laborer, 18 years.

District V

Robert L. Cate, Lead Groundsman, 9 years.

District VI

Howard F. Briggs, Senior Highway Engineer, 40 years; Earle R. Bunker, Supervising Right-of-Way Agent, 23 years; Ergen Craun, Associate Highway Engineer, 33 years; Edward J. Kahl, Highway Equipment Operator-

Laborer, 26 years; Oda L. Mackie, Laborer, 22 years; Verne Simpson, Highway Foreman, 38 years; John J. Steinman, Associate Right-of-Way Agent, 28 years; Walter P. Stewart, Highway Leadingman, 26 years.

District VII

Roy E. Bruce, Highway Equipment Operator-Laborer, 23 years; Earle H. Dewing, Senior Highway Engineer, 29 years; Robert H. Galbraith, Highway Equipment Operator-Laborer, 22 years; Felix Jeunnette, Watchman, 10 years; Matthew Leipniker, Delineator, 6 years; Kenneth D. Lewis, Assistant Highway Engineer, 35 years; Russell Madden, Highway Equipment Operator-Laborer, 25 years; Ernest R. Scott, Assistant Highway Engineer, 26 years; Erwin O. Tagley, Laborer, 25 years; Warren E. Wescott, Sr., Highway Field Office Assistant, 21 years; Clarence Zook, Highway Field Office Assistant, 23 years.

District VIII

Ernest A. Bannister, Associate Highway Engineer, 39 years; William T. Gustin, Laborer, 20 years; Harry Isherwood, Plumber, 28 years; Thomas E. Smith, Highway Equipment Operator-Laborer, 30 years; Sidney J. Winter, Highway Equipment Operator-Laborer, 26 years.

District X

Costanzo M. Cicconi, Sr., Laborer, 22 years; Lum Hayhurst, Laborer, 24 years; Louis H. Kahl, Highway Superintendent, 24 years; Albert J. Kerner, Drawbridge Operator, 27 years; Thomas M. Sommer, Highway Foreman, 23 years; Arthur L. Stevens, Drawbridge Operator, 29 years; George Trekos, Deckhand, 6 years; Walter M. Warner, Highway Equipment Operator-Laborer, 20 years.

District XI

Cary D. Klump, Highway Foreman, 24 years; Howard E. Porter, Highway Equipment Operator-Laborer, 16 years.

State-owned Toll Bridges

Leo N. Idle, Assistant Steel Inspector, 19 years.

New Standard 'Specs' Revision Is Ready

A new edition of the Standard Specifications of the California Division of Highways dated January 1960 has been issued.

This new edition is the result of a year and a half of intensive work by many members of the staff of the Division of Highways and incorporates the latest ideas and developments in highway design and construction practices.

A number of meetings were held with organizations representing contractors, materials producers and equipment manufacturers before the final edition was printed. The result of these meetings has been to improve and bring up to date many of the specifications.

The new Standard Specifications supersede the previous edition which was dated August 1954 and will be effective for contracts to be awarded after January 1, 1960.

Copies of the new Standard Specifications may be purchased from the State Printing Plant, Printing Division, Document Section, Sacramento 14, California, at a price of \$1.50 including sales tax for the paper-covered copy and \$2.60 including tax for the flexible cloth binding.

Headquarters Office

Katherine Reid, Delineator, 7 years; Ray A. Dolliver, Storekeeper, 16 years.

Materials and Research

Louise Hawkins, Intermediate Stenographer-Clerk, 13 years; Alberta Weekley, Janitor, 6 years.

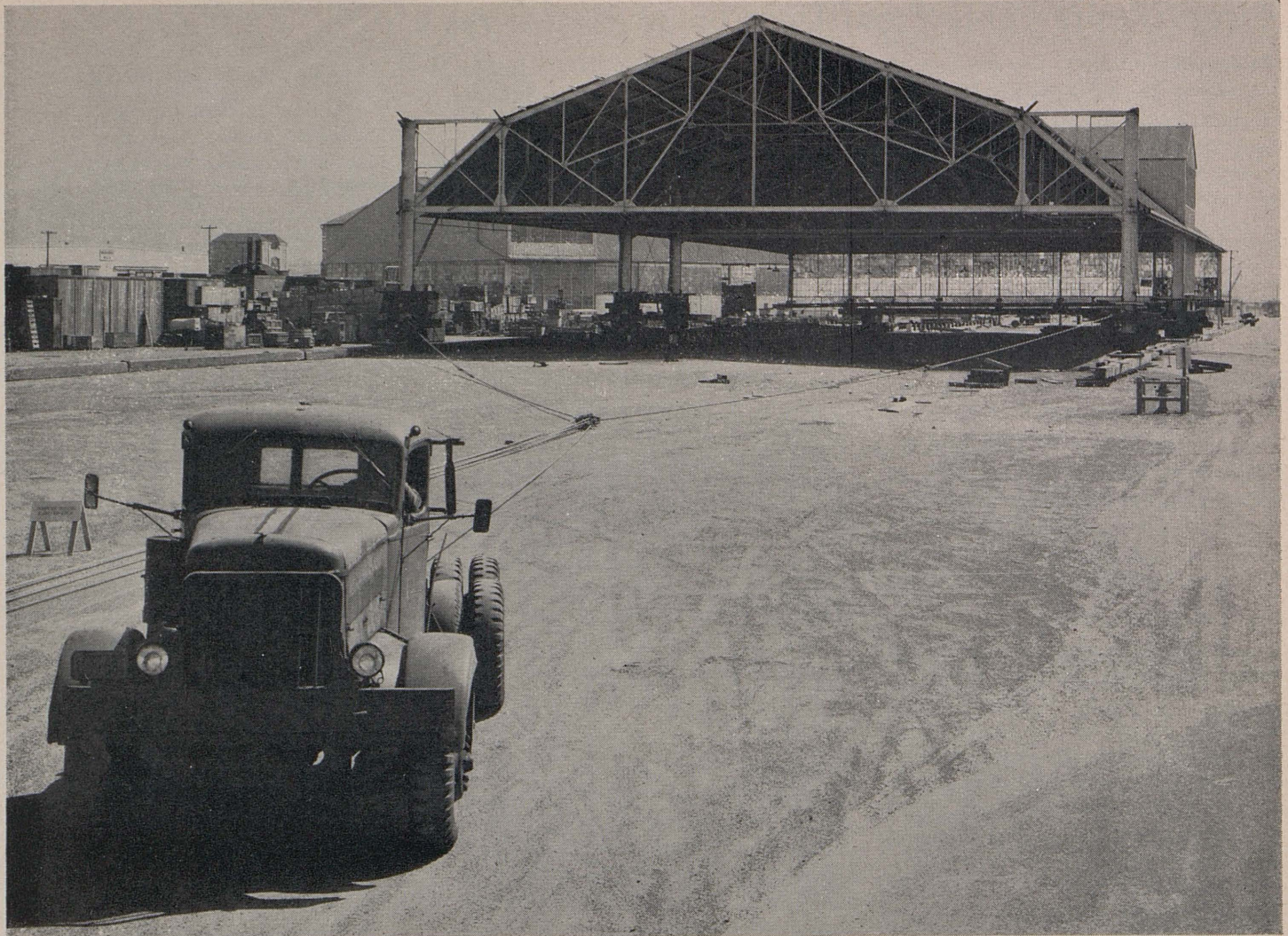
Shop 2

Albert T. Housman, Auto Mechanic, 23 years.

Shop 4

Henry R. Hallgren, Auto Mechanic, 15 years; Oscar A. Kamp-

... Continued on page 56



Hangar being moved. Note block and tackle method. Projecting ends of H columns for bin frameworks may be seen beneath building.

Record Move

*Navy Hangar Relocated
For Webster Street Tube*

CALIFORNIA claims the biggest building move on record in the relocation of an old airplane hangar in Alameda from the right-of-way for the new Webster Street tube. The move, completed this year, was a three-way cooperative effort between the Navy, which uses the building as a warehouse, the Division of Highways, and the Division of Architecture.

The hangar, built in the 1930's to serve the now vanished "East Bay Airdrome," was 601 feet long, 120 feet wide, 60 feet high, and weighed 1,100 tons. California engineers estimate it

to be 40 percent bigger than the hangar recently moved in Massachusetts, which was claimed at the time to be the largest building ever moved.

The huge structure had to be moved 1,200 feet. Furthermore, the new site the Navy had for it would not accommodate its 600-foot length, but could take a wider building. To fit the site, the hangar was cut in two, and the halves placed side by side.

In making the move, the contractor, Montgomery House Movers of Oakland, used enough timbers, rollers, blocks and other wood to build 12

average size houses. Under the center columns, 24-inch I-beams 40 feet long, with standard railroad rails welded to them for the full length, were used for additional support against deflection.

The contractor's big worry was wind. Without any substantial cross-bracing, with two sides and an end open, and the sides resting on piers without foundations, a gale could have lifted one of the big sections and reduced it to broken glass and scrap metal in a few moments. A light gale did rise once during the operation, but emergency crews were able to brace

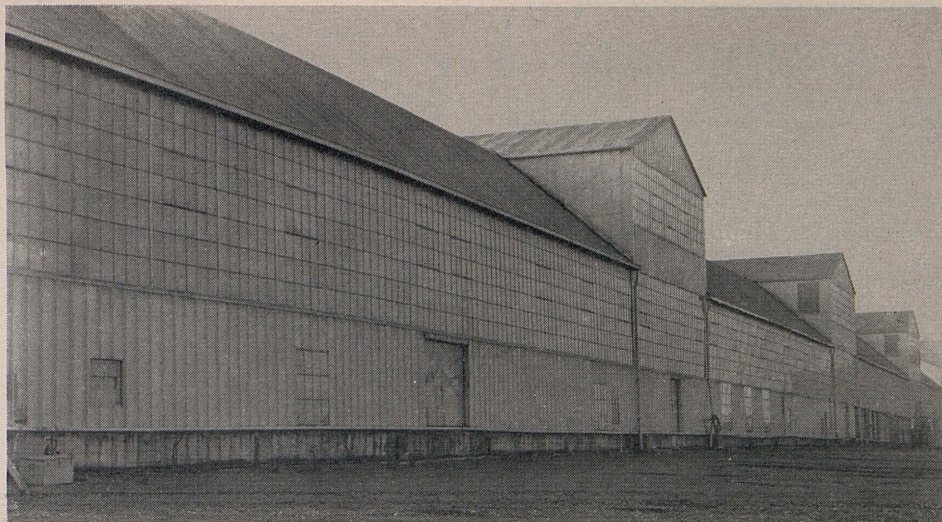
the building before the wind could distort it.

The path of the move was difficult, also. Not only was it necessary to move and replace fire hydrants, electric wires, and other installations, but a group of big scrap metal bunkers were squarely in the middle of the only feasible path. These were built on large H columns set in concrete slabs, and it was necessary to burn off the columns with acetylene torches, remove the bins, then weld the columns in place again afterward.

Rolling doors comprised most of the south wall of the building, and the remainder of the walls were steel sash and metal siding. The Navy required that the relocated building have sliding doors on both the north and south sides and that each side be similar in appearance.

After the building was cut in half, one of the halves was moved to the new position, then the other half was rotated 180 degrees as it was moved. This left the sliding doors on the two outer sides of the sections.

It was necessary to leave 12 feet between the two sections for the contractor's equipment to operate. A new flat steel deck roof with a waterproof membrane was built over this opening,



"Before" photo of building. Center dormer was removed entirely. (U. S. Navy photo.)

joining the two sections and enclosing the roof space.

The open ends of the two halves were enclosed with steel sash and new corrugated metal siding. These end walls are supported on a new system of columns and girts. The roof framing also was altered to provide new lateral bracing to resist wind forces on the new end frame. A new concrete foundation, supported on 7,656 lineal feet of creosoted wood piles, was constructed at the new site.

Plans and specifications for the project were prepared by the California Division of Architecture. Construction work was supervised by the California Division of Highways. Peter Filipovich was resident engineer for the project under the general supervision of V. O. Smith, District IV Construction Engineer. Right-of-way negotiations were under the general supervision of F. J. Kane, Supervising Right-of-Way Agent.



Slab floor of old building settled seriously on tide land fill. Archie Prescott of Navy Public Works here shows where supplementary asphalt ramp had to be built to accommodate warehouse rolling stock.



Floor actually sank beneath foundation footings in places. Pile cap is almost exposed at this point.

IN MEMORIAM

Division of Highways

Headquarters

William W. McBeath, Photocopyist.

District I

Earl Klein, Highway Leadingman.

District II

Eugene P. Godman, Highway Equipment Operator-Laborer.

District III

Guy E. White, Highway Leadingman.

District IV

Charles K. Boyle, Highway Engineering Technician; George W. Loehr, Intermediate Clerk; Harvey J. Potter, Highway Leadingman; Denzil F. Squire, Highway Equipment Operator-Laborer.

District VI

Clyde F. Johnson, Highway Superintendent; Joseph T. Landers, Assistant Highway Engineer; Cecil A. Massie, Highway Equipment Operator-Laborer; Walter D. Stone, Highway Leadingman.

District VII

E. Brooks Currey, Sr., Supervising Highway Engineer; John Lowell Henderson, Highway Engineering Technician; Albert J. Janulaw, Highway Landscaping Leadingman; Keith G. Loeser, Highway Equipment Operator-Laborer; Kenneth Thornhill, Assistant Right-of-Way Agent.

District VIII

Cecil C. Monroe, Highway Equipment Operator-Laborer.

District IX

Mary E. Blake, Engineering Aid.

District X

Darrell J. Black, Highway Equipment Operator-Laborer; George A. Bledsoe, Laborer; Jack M. Garrison, Drawbridge Operator; Edmund A. Peard, Highway Equipment Operator-Laborer; Louella C. Ritter, Accounting Technician.

Resident Engineer K. D. Lewis Retires

K. D. Lewis, long-time resident engineer with District VII, recently retired from state service. He was born in La Verne, California, on August 3, 1902, one of a family of four brothers and five sisters. He attended grade school and high school in Turlock in the San Joaquin Valley, where he was later employed as a packinghouse hand and grocery clerk. He entered state service on August 15, 1923, as chainman and rodman in District IV, San Francisco, then transferring to jobs in Eureka and at Lake Tahoe; in 1932 he was assigned to District VII, where he remained until his retirement. While in the Los Angeles office, he worked on road construction projects in Topanga Canyon, the Conejo Grade, Lincoln Boulevard in Santa Monica, Manchester Boulevard in Inglewood, Palmdale and the Ridge Route.



K. D. LEWIS

Joining K. D. Lewis in his new dairy homestead in Oakdale, Stanislaus County, are his wife, Myrtle Joanna, and daughters, Marsha and Myrtle.

Mules are being used to transport fencing materials in the rugged mountain terrain encountered on a highway project between Lemon Cove and Three Rivers in Tulare County.

Bridge Department

Walter K. Kemp, Assistant Bridge Engineer.

State-owned Toll Bridges

William R. Shaw, Structural Steel Painter.

Headquarters Shop

Myrl Fleming, Mechanic's Helper; John A. Ruggs, Fusion Welder.

Shop 9

Roy L. Nerren, Laborer.

Division of Contracts and Rights-of-way

Norris J. Burke, Attorney.

Road Conference Set At UCLA Jan. 28-30

State Director of Public Works Robert B. Bradford will head a group of 10 department employees taking part in the Twelfth Annual California Street and Highway Conference on January 28 to 30, 1960. The conference, which is sponsored by the Institute of Transportation and Traffic Engineering of the University of California, will be held at the U. C. L. A. campus in Los Angeles.

Ellis Armstrong, Commissioner of the U.S. Bureau of Public Roads, is scheduled to deliver the keynote address at the opening session of the conference. The legislative view of the California highway program will be presented by State Senator Randolph Collier of Yreka and Assemblyman Lee M. Backstrand of Riverside. The welcoming address will be given by L. M. K. Boelter, Dean of the College of Engineering at U. C. L. A.

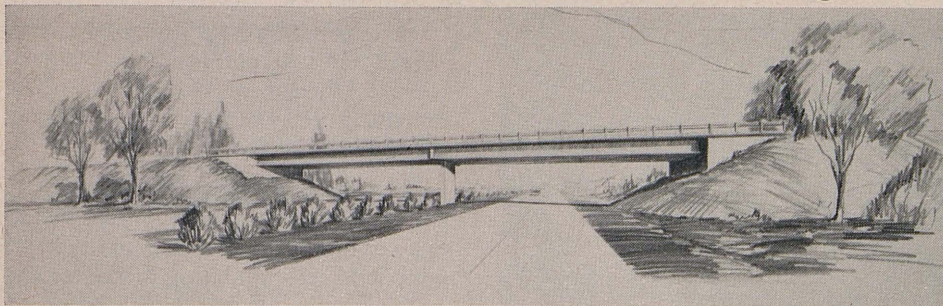
General chairman of the conference is Victor W. Sauer, Director of Public Works for Contra Costa County.

The other nine public works employees who will participate are:

Edward T. Telford, Assistant State Highway Engineer, District VII; H. B. LaForge, Engineer of Federal Secondary Roads; Frank E. Baxter, Maintenance Engineer; Karl Moskowitz, Assistant Traffic Engineer; R. J. Israel, Assistant Traffic Engineer; Cal Kiedaisch, Engineer of Federal Secondary Roads for the Bridge Department; Luis Aramayo, Assistant District Engineer of District II, all Division of Highways employees; Harry S. Fenton, Assistant Chief Counsel of the Division of Contracts and Rights of Way; and John H. Stanford, Management Analyst of the Department of Public Works.

During October, the Highway Commission completed allocations for 1959 from the \$5,000,000 Grade Separation Fund, established by the Legislature in 1957 as a yearly appropriation from the State Highway Fund. \$4,990,789 will be used to construct seven grade crossing structures which are not on the State Highway System. The remaining \$9,211 of the fund has reverted to the State Highway Fund.

Bridge Entry Wins \$5,000 Award for Three Engineers



The winning entry submitted by Jurkovich, Fraleigh and Shulman. Each of the spans is 80 feet long, making a total bridge length of 160 feet. According to the designers, the outstanding advantage of their entry is that, because of the single support column, the entire pier can be rotated to eliminate any skew without encroaching on either the horizontal or vertical clearance requirements.

Three Division of Highways bridge engineers were named winners of the \$5,000 second honorable mention award in the professional category of the Steel Highway Bridge Design Competition sponsored by the American Bridge Division of U.S. Steel. William J. Jurkovich, Senior Bridge Engineer, and Douglas M. Fraleigh and Marvin A. Shulman, Associate Bridge Engineer, shared the cash award for their joint entry (shown in the accompanying photo).



WILLIAM J. JURKOVICH

The competition, which offered 15 professional and student awards totaling \$44,000, attracted 300 entries from the United States and abroad. Judging was under the auspices of the American Institute of Steel Construction.

Jurkovich won his B.S. in civil engineering at the University of California in 1943 and came to work for the division in 1946. Since 1953 he has supervised the operation of the design section of the Bridge Department in the preparation of contracts, plans and estimates. At present he is working on the suspension bridge across the Los Angeles Harbor between San Pedro and Terminal Island.



DOUGLAS M. FRALEIGH

Fraleigh received his B.S. in civil engineering from the University of Kentucky in 1951. At present he is assigned to bridge and grade separation structure design and the design of welded towers for a proposed suspension bridge.

Shulman received his civil engineering degree from the University of California in 1951 and joined the Bridge Department the same year. His latest work has been as project engineer in preparation of contract plans for various types of bridge structures. He won first honorable mention in the AISC competition in 1957 for a design for the Trinity River Bridge.



MARVIN A. SHULMAN

Harry B. Milner

Harry B. Milner, Assistant Design and Planning Engineer of the Division of Highways headquarters office in Sacramento, died of a heart attack on October 21.

As a member of the design staff, Milner carried out preliminary investigations of the district plans for highway improvements and the status of plan production. He was also responsible for the review of the location and design of many projects submitted by the districts to the headquarters office.

A native of Clifton, Arizona, Milner attended public schools in Reno, Nevada. After working for the Nevada Highway Department and the U. S. Bureau of Public Roads, he came to work for the California Division of Highways in 1929 as an assistant resident engineer and later as a resident engineer.

From 1943 to 1945 Milner served as a lieutenant commander with the U. S. naval construction battalions in the United States and Europe.

He was promoted to Assistant Design and Planning Engineer in 1949.

Milner is survived by his wife, Marion, and a daughter, Mrs. Constance Felton, of Redding.

Bids were opened December 8 for steel work on a six-story addition to the Public Works Building in Sacramento.

Koritz Named Editor of Highway Magazine

Effective with this issue, the editor of *California Highways and Public Works* is Lester S. Koritz, former newspaperman and a public information officer in state service since 1948.

A native of Boston, Koritz began his newspaper career in that city, but left it for California in 1931. He returned to newspaper work after graduation from the University of Southern California, serving on the staff of the *Santa Barbara News-Press* from 1938 to 1948 (except for three years of military leave).

He served in Army combat intelligence in World War II from 1943 to

1946, including campaigns with the 28th and 86th Infantry Divisions in the European Theater of Operations. He was released from active duty as a first lieutenant.

Koritz entered state service in 1948 as public information officer for the Department of Veterans Affairs, and transferred to the Division of Highways in 1951.

As editor of the magazine, Koritz succeeds Richard Winn, who resigned from state service in October to become manager of the Public Information Department of the Los Angeles Metropolitan Transit Authority.

'Freeways For You' Display Wins Fair Award



"Freeways for You—Now and in 1980" was the theme used in the California Division of Highways exhibit at the California State Fair in Sacramento in September. Featured were two finely detailed models of city freeways—one showing a section depressed below ground level and the other a fill and viaduct section above ground level. Ultimate landscaping and relationships with the surrounding neighborhood were carefully delineated. It is estimated more than a hundred thousand people visited the exhibit during the 13-day State Fair

POSTS FILLED

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office in Sacramento, as Photogrammetric Engineer.

Funk has been identified for many years with the expanding use of photogrammetry in highway location and design work. Earlier this year he won a national award for his contributions to photogrammetric science.

At the end of October, construction contracts totaling \$139,000,000 were in force under supervision of the Division of Architecture.

run. The large wall map showed the routes included by the 1959 Legislature in the state highway system for freeway and expressway development between now and 1980.

Staff engineers of the Division of Highways were on hand to answer the numerous questions of the fairgoers and to distribute booklets on freeway planning and right-of-way procedures.

The display won second place in the Business and Professional Services Division judging of State Fair exhibits.

Regular monthly traffic counts for October 1959 show an increase of 6.0 percent over October 1958, but a decrease of 4.1 percent under September 1959. Based on an average of the last five years, October counts have shown a decrease of 5.4 percent under September. Comparing October 1959 with October 1958, passenger vehicles show an increase of 6.4 percent and freight vehicles show an increase of 3.8 percent. Freight vehicles represented 18.0 percent of the total weekday traffic.

Sam Osofsky

Sam Osofsky, Highway Economist for the Division of Highways in Sacramento, died on October 25 following a short illness.

He played a major role in developing procedures for handling engineering computations for the division on punched card tabulating machines and on magnetic drum data processing equipment. He twice received honorable mention by the L. I. Hewes Award as a member of a team engaged in developing new techniques in this field.

A graduate in electrical engineering from the University of California at Berkeley, Osofsky came to work for the Division of Highways as a statistician in 1934. He supervised the Statewide Motor Vehicle Use Survey and the metropolitan origin and destination surveys made by the division.

A native of New York City, he attended city schools in Sacramento. During World War II he served as a navigator with the U. S. Air Force.

He was a member of the Western Governmental Research Association, the Institute of Traffic Engineering and the American Statistical Association.

He is survived by his wife, Pearl, and son, Raymond Carl.

NEW DEPUTIES

Continued from page 19 . . .

the Sacramento Bureau of the San Diego *Union* for the past seven years. He was previously a reporter for the San Diego *Union*, the Chicago *Daily News* and the Chicago *Tribune* and night editor of the Chicago City News Bureau.

Cooper was born in Kansas City, Missouri, in 1917 and studied at the University of Pittsburgh and the University of Minnesota. He served in the Marine Corps during World War II and the Korean campaign.

Cooper, his wife, Grace, and their two children live at 1124 45th Street, Sacramento.

New Budget

Allocations for 1960-61 Reflect
Slowdown in Federal-aid Program

THE California Highway Commission in October adopted a \$569,243,867 State Highway Budget for the 1960-61 fiscal year.

The budget contains \$452,784,507 for state highway construction purposes including rights-of-way.

The budget for the current fiscal year, adopted by the commission in October 1958, contained a gross total of \$610,711,852, of which \$497,000,000 was for construction and rights-of-way.

State Director of Public Works Robert B. Bradford, chairman of the commission, said that the decrease from the 1959-60 budget totals is due to a reduction in the federal highway apportionment for 1960-61.

The total federal highway apportionment to California for 1960-61 is \$227,708,867, of which \$181,086,840 is for work on routes included in the National System of Interstate and Defense Highways.

The 1959-60 federal apportionment was \$302,020,852, including \$252,779,750 for interstate highways.

"Although our federal share is about \$74,000,000 less than for 1959-60," Bradford said, "the estimated revenue from state sources is up approximately \$33,000,000 from the current year's budget estimates, as a result of constantly increasing motor vehicle registration and use.

"This increasing traffic, a reflection of California's continuing explosive growth, makes the stretchout of the federal highway program particularly hard on our State. It was simply not possible to include in this budget many urgent projects which are badly needed right now for safety and relief from congestion.

"We don't like to have to trim our sails on this vital program of highway improvement, but since the federal financing problem has made it necessary I think we have the best budget currently possible. It is based on sound, orderly long-range planning to meet future as well as current needs."

Tax Sources Listed

Major sources of state-collected highway revenue expected for the 1960-61 fiscal year include: \$253,500,000 in gasoline taxes (up \$20,400,000 from the previous year's estimate); \$53,000,000 from motor vehicle fees (up \$8,700,000 from previous year's estimate); \$22,300,000 from the use (diesel) fuel tax (up \$2,000,000 from previous year); and \$11,500,000 from transportation taxes on for-hire carriers (up \$1,500,000).

The budget contains \$53,299,360 for functions other than state highway work.

The largest item in this category is \$34,257,000 for major city streets other than state highways based on five-eighths cent per gallon of the state gasoline tax. Other nonstate highway items are:

Federal aid for county roads on the federal-aid secondary system, \$8,388,160; state funds to counties for use in matching these federal funds, \$4,254,200; state funds for matching city and county funds for elimination of railroad grade crossings on local streets and roads (not state highways), \$5,000,000; and engineering funds for cities, \$1,400,000.

\$87,750,000 to Counties

Bradford pointed out that California's 58 counties receive 1 $\frac{3}{8}$ cents per gallon from the State's 6-cent per gallon gasoline tax, plus a portion of the state motor vehicle fees. These funds are not listed in the State Highway Budget because they are disbursed directly by the State Controller. For the 1960-61 fiscal year these state funds for county roads will total an estimated \$87,750,000. Another \$1,100,000 per year in gasoline tax funds is earmarked by state law for airports and small craft harbors.

The \$452,784,507 in the budget for highway construction purposes includes:

Major construction and improvement (contracts plus engineering),

\$317,519,000; rights-of-way, \$121,787,304; contingencies (normally available for construction purposes), \$6,178,203; resurfacing program, \$5,000,000; signs and striping, \$1,500,000; and minor improvements, \$800,000.

Proposed expenditures for state highway purposes other than construction include: Maintenance, \$37,200,000; buildings and plants, \$8,000,000; administration, \$10,300,000; statewide highway planning survey, \$3,000,000; maintenance of state toll bridges, \$2,800,000; and honor camps, \$1,750,000.

The 1960-61 budget contains 29 landscaping and planting projects. The total budgeted for these projects is \$4,582,000, an increase of more than \$500,000 over the amount budgeted for such purposes a year ago.

Other significant features of the 1960-61 budget are as follows:

Los Angeles Region

The 1960-61 State Highway Budget provides for \$84,886,000 in highway construction in Los Angeles, Orange and Ventura Counties, the three counties which make up District VII of the Division of Highways.

The budget also contains \$61,565,000 for the purchase of rights-of-way in this three-county region, including \$18,000,000 for the Santa Monica Freeway and \$14,600,000 for the San Diego Freeway, both in the Los Angeles area.

Construction emphasis in Los Angeles County is centered on the San Diego Freeway, the Golden State Freeway, and on other key routes in the basic metropolitan freeway network.

Two budgeted projects on the San Diego Freeway, estimated to cost \$13,700,000, together with an \$8,600,000 project for which the commission last week voted 1959-60 funds, will complete the San Diego Freeway for nine miles from the Long Beach Freeway to 174th Street, including the interchange with the Harbor Freeway.

Another San Diego Freeway project will complete freeway development through the Santa Monica Mountains. This \$13,950,000 job will connect with completed freeway sections to provide 14.3 miles of continuous freeway from Jefferson Boulevard in Culver City to Burbank Boulevard, north of the Ventura Freeway. In addition, this project includes grading for future freeway construction northward to Nordhoff Street.

Additional grading in the San Fernando area is included in a \$14,000,000 project which also provides for freeway and interchange construction on the Golden State Freeway.

Funds are budgeted for interchange and freeway construction at the future Ventura-Golden State Freeway junction, and for the extension of the Hollywood Freeway north from the Ventura Freeway.

On the Santa Monica Freeway, a budgeted project includes the final portions of the Santa Monica-Harbor Freeway interchange. Together with current and previously budgeted projects, this job will complete freeway development between the Santa Ana and Harbor Freeways.

The budget also contains allocations for grading on the route of a future U. S. Highway 6 freeway southwest of Palmdale; for freeway construction on the Glendale Freeway, and for widening a one-mile section of the Santa Ana Freeway to eight lanes.

Eight landscaping and planting projects costing an estimated \$1,525,000 are included in the budget for Los Angeles County.

The largest budgeted project in Orange County is the first unit of the Newport Freeway between the Santa Ana and Riverside Freeways. The budget also contains large allocations for the purchase of rights-of-way on the Newport and Garden Grove Freeways.

More than \$11,000,000 is allocated for construction and rights-of-way in Ventura County, including \$6,500,000 to complete freeway development on U. S. Highway 101 through Ventura.

San Diego Area

In the San Diego area, the budget contains \$5,800,000 to provide structures and sections of roadway for a

future north-south freeway on U. S. Highway 101 in San Diego. Also budgeted are a project to provide structures and grading on a future U. S. 101 freeway route north of San Diego, and a 5.5-mile freeway project on State Sign Route 78 west of Escondido.

Funds are allocated for 6.9 miles of freeway on U. S. Highway 80 through the sand hills east of Holtville, Imperial County.

Riverside-San Bernardino

Freeway development in the Riverside-San Bernardino area will be continued with the budgeting of large-scale freeway projects in this region.

Two projects on US Highway 70-99, estimated to cost \$16,200,000, will provide 11 miles of continuous freeway through the Redlands area.

The budget also contains \$800,000 to convert the Riverside Freeway from expressway to full freeway in and north of Riverside; \$506,000 for approaches to the Colorado River Bridge now under construction near Blythe; and a total of \$620,000 for two interchanges, one on the San Bernardino Freeway west of Colton, and the other on US 60-70-99 near Thousand Palms.

In addition to these projects, the Highway Commission last week voted \$2,900,000 in 1959-60 funds to complete the financing on the previously budgeted 7.1-mile freeway project on the Riverside Freeway through Corona. Total allocation for this project is \$7,184,000.

San Francisco Bay Area

The 1960-61 budget contains \$17,800,000 for three large-scale freeway projects in the vicinity of Oakland, and another \$10,000,000 for a third two-lane tunnel (Broadway Tunnel) on State Sign Route 24 at the Alameda-Contra Costa county line.

Two of the freeway projects are on the MacArthur Freeway (US 50). These projects, together with a previously budgeted job, will complete freeway development from the East Bay Distribution Structure to 14th Avenue. The third freeway job involves widening to eight lanes on a 5.6-mile section of the Nimitz Freeway (Sign Route 17).

A \$6,000,000 project on the Southern Freeway in San Francisco will provide eight-lane freeway for 1.3 miles between Ocean Avenue and Mission Street. Landscaping along 3.5 miles of San Francisco's Central and James Lick Freeways is covered by an allocation of \$460,000.

The budget contains \$5,450,000 for 6.1 miles of freeway construction on the Bayshore Freeway north of San Jose. This job, together with projects now under construction or previously budgeted, will complete the Bayshore Freeway for 48.5 miles from San Francisco to San Jose.

The budget also provides funds for freeway construction on US Highway 40 north of Vallejo, on the Vallejo-Benicia Highway in and near Benicia, on US Highway 101 in and north of Santa Rosa, and on Sign Route 17 north of Santa Cruz.

Sacramento Area

The budget contains funds for three large-scale freeway projects in and near Sacramento. A total of \$4,500,000 is included for construction of interchanges at Citrus Road and Folsom junction on US 50 east of Sacramento; \$5,470,000 is provided to complete the South Sacramento Freeway (US 50-99); and \$704,000 is allocated for widening a 2.1-mile section of the North Sacramento Freeway (US 40-99E).

On US 50 in the Sierra Nevada, there is a \$3,240,000 freeway project for 2.7 miles in and east of Placerville.

U. S. Highways 101 and 99

On US Highway 101, the budgeted projects outside major metropolitan areas will continue the conversion of this route to freeway and expressway standards.

In Santa Barbara and San Luis Obispo Counties, the only remaining gap in 101 miles of continuous freeway and expressway will be closed by construction of a freeway bypassing Santa Maria. Another gap in a long stretch of continuous freeway and expressway will be eliminated by a freeway project at Greenfield, Monterey County. Three large-scale projects are included in Humboldt County, near Myers Flat, Fortuna and Fields Landing.

On US 99 the major projects outside major metropolitan areas are the first two units of the Bakersfield Bypass; conversion from expressway to freeway on a 13-mile section in Tulare County; a freeway project near Fowler; and the first units of freeway construction through Merced and through Modesto.

Other Major Projects

Several other million-dollar-plus projects in the budget will provide the initial two lanes of future four-lane freeway and expressway on major rural and mountain highways. Among them are:

US 40 Alternate, 4.3 miles in the Quincy-Portola area, US 395, 11.9 miles on a section southeast of Susan-

ville, US 299, 5.1 miles just west of Shasta-Trinity county line, also relocation around Whiskeytown Reservoir; and State Sign Route 56, 12.1 miles between Cayucos and Cambria in San Luis Obispo County.

Another major project provides for a four-lane expressway on new alignment over Conway Summit, in Mono County, on US 395.

1960-61 State Highway Budget Projects by Counties

NOTE 1. Construction contracts may be awarded beginning January 1, 1960. Right-of-way funds may not be expended until July 1, 1960 (start of fiscal year).

NOTE 2. Projects which overlap county lines are listed under both counties.

County	Route†	Description	Approximate mileage	Estimated cost
Alameda	5 (US 50)	MacArthur Freeway—San Pablo Ave. in Emeryville to Broadway in Oakland; grade, pave and structures for 8-lane freeway	1.1	\$8,000,000
Alameda	5 (US 50)	MacArthur Freeway—0.3 mile west of Grand Ave. to 14th Ave. in Oakland; grade and pave for 8-lane freeway. (These two projects, together with previously budgeted jobs, will provide 8-lane freeway from the East Bay Distribution Structure to 14th Ave. in Oakland)	1.7	5,000,000
Alameda	5 (SR 9)	Orchard Ave. to 0.1 mile south of Gresel St. in and near Hayward; grade and pave to widen from 3 to 4 lanes	3.6	690,000
Alameda, Contra Costa	69-7 (US 40)	0.3 mile south of El Cerrito Overhead in Albany to 0.3 mile south of Jefferson Ave. in Richmond; landscape	2.6	280,000
Alameda	69 (SR 17)	Nimitz Freeway—Hegenberger Rd. to Fallon St. in Oakland; grade, pave and structures to widen to 8 lanes	5.6	4,800,000
Alameda	69 (SR 17)	Fifth Ave. Overhead to Linden St. in Oakland; landscape	1.5	35,000
Alameda, Contra Costa	75 (SR 24)	Broadway Tunnel—Construct a third two-lane tunnel (will permit use of four lanes in one direction during peak travel hours)	1.1	10,000,000
Alameda	Various	Rights of Way (includes \$4,940,000 for MacArthur Freeway)		8,335,000
Alpine	Various	Rights of Way		10,000
Amador	34 (SR 104)	Dry Creek Bridge west of Ione; new bridge and approaches		110,000
Amador	Various	Rights of Way		80,000
Butte	3 (US 99E)	The Esplanade—Big Chico Creek to 0.3 mile north of Lindo Channel in and north of Chico; planting	1.8	10,000
Butte	3 (US 99E)	20th St. to 1st St. in Chico; reconstruction and resurfacing (additional related work to be performed by the Sacramento Northern Railroad)	1.3	200,000
Butte	Various	Rights of Way		435,000
Calaveras	Various	Rights of Way		50,000
Colusa	88 (SR 45)	Main St. in Grimes to Sycamore; widening with some realignment	6.1	250,000
Colusa	Various	Rights of Way		440,000
Contra Costa	7 (US 40)	Ridge Rd. to Carquinez Bridge in and near San Pablo, Richmond, Pinole and Hercules; planting	8.0	25,000
Contra Costa, Alameda	69, 7 (US 40)	0.3 mile south of El Cerrito Overhead in Albany to 0.3 mile south of Jefferson Ave. in Richmond; landscape	2.6	280,000
Contra Costa, Alameda	75 (SR 24)	Broadway Tunnel—Construct a third two-lane tunnel (will permit use of four lanes in one direction during peak travel hours)	1.1	10,000,000
Contra Costa	75 (SR 24)	Orinda Rd. to west of Sunnybrook Dr. (west of Lafayette); landscape	1.7	125,000
Contra Costa	75, 107 (SR 24 and 21)	East of Pleasant Hill Rd. to Walden Rd. and Creekside Dr.; landscape (Walnut Creek Bypass)	4.5	350,000
Contra Costa	Various	Rights of Way (including \$1,230,000 for Rt. 75-E in Concord area)		3,332,000
Del Norte	1 (US 199)	2.6 miles to 1.1 miles south of Oregon border; grading north approach to future Oregon Mountain Tunnel	1.5	770,000
Del Norte	Various	Rights of Way		75,000
El Dorado	11 (US 50)	Sportsmans Hall (east of Camino) to Strawberry; construct chain change areas at 4 locations		85,000
El Dorado	11 (US 50)	Riverton to Meyers; construct truck passing lanes at 6 locations		300,000

† Numbers marked SR are State Sign Routes; numbers marked US are US Highway routes; numbers not marked are legislative routes. * State's share.

County	Route†	Description	Approximate mileage	Estimated cost
El Dorado	11 (US 50)	Washington St. to Railroad Crossing in and east of Placerville; grade, pave and structures for 4-lane freeway	2.7	3,240,000
El Dorado	93	Georgetown-Cool Highway—Morgan Grade to Cool (portions); curve improvements		50,000
El Dorado	Various	Rights of Way		1,410,000
Fresno	4 (US 99)	0.4 mile south of Highland Ave. to 0.3 mile north of Chestnut Ave. in vicinity of Fowler; grade, pave and structures for 6-lane freeway	9.7	7,724,000
Fresno	138 (SR 33)	4.0 miles south of Belmont Ave. to Sign Route 180 in Mendota; grade and pave (widen to 4 lanes from Belmont Ave. to Sign Route 180) (Cooperative Project—Mendota's share, \$11,000)	0.9	169,000 (State's share)
Fresno	Various	Rights of Way (includes \$3,140,000 for US 99 freeway between Tulare County line and Fresno)		3,481,000
Glenn	Various	Rights of Way		250,000
Humboldt	1 (US 101)	Redwood Freeway—Eel River at Myers Flat; construct bridge and grade approaches		1,915,000
Humboldt	1 (US 101)	Chadd Creek (north of Redcrest); culvert and channel change		43,000
Humboldt	1 (US 101)	1.8 miles north of Sign Route 36 (near Alton) to 0.3 mile north of Fortuna; structures on future route of 4-lane freeway bypassing Fortuna		910,000
Humboldt	1 (US 101)	0.2 mile south of Loleta Dr. to 1.2 miles north of White Slough near Fields Landing; (portions) grade, pave and structures to construct 4-lane freeway and convert existing expressway to freeway	3.7	2,590,000
Humboldt	35 (SR 36)	Little Larabee and Butte Creeks (east of Bridgeville); replace two bridges	0.6	137,000
Humboldt	35 (SR 36)	9.6 to 11.1 miles east of Bridgeville (portions); realign and construct 2 cattlepasses	0.4	65,000
Humboldt	Various	Rights of Way		695,000
Imperial	27 (US 80)	1.1 miles west of Grays Well to 0.5 mile west of Ogilby Rd. east of Holtville (through sand hills); grade, pave and structures for 4-lane freeway	6.9	2,600,000
Imperial	Various	Rights of Way		300,000
Inyo	23 (US 6-395)	0.2 mile south of south city limit of Bishop to north city limit; reconstruct and resurface	0.9	95,000
Kern	4 (US 99)	2.8 miles south of McKittrick Rd. to Ming Ave. south of Bakersfield; grade, pave and structures for 4-lane freeway	12.2	7,850,000
Kern	4 (US 99)	0.3 mile south of the Atchison, Topeka and Santa Fe Railway to 0.2 mile north of Kern River (portions); structures and approaches for future freeway (this project and the previously listed job are the first two units of a new freeway on US 99 bypassing Bakersfield on the west)	1.0	1,150,000
Kern	4 (US 99)	0.4 mile south of Airport Rd. to the Tulare County line (near Delano); landscape	3.5	85,000
Kern	Various	Rights of Way (includes \$2,287,000 for US 99 freeway in Bakersfield area)		4,307,000
Kings	Various	Rights of Way (includes \$750,000 for Sign Route 198 freeway in Hanford-Lemoore area)		980,000
Lake	49 (SR 53)	St. Helena Creek to Middletown; grade and pave to construct 2-lane expressway	4.2	625,000
Lake	Various	Rights of Way		160,000
Lassen	29 (US 395)	0.4 mile south of Baxter Creek to 2 miles north of Milford; grade, pave and structures for realignment to provide initial 2 lanes of future 4-lane expressway	11.9	1,345,000
Lassen, Modoc	73 (US 395)	0.8 mile south to 0.5 mile north of the Modoc County line near Likely; grade, pave and structures for realignment to provide initial 2 lanes of future 4-lane expressway	1.3	125,000
Lassen	Various	Rights of Way		50,000
Los Angeles	2 (Old US 101)	Ventura Blvd.—Vineland Ave. to Kelvin Ave. in Los Angeles; resurfacing	12.8	210,000
Los Angeles	2 (US 101)	Ventura Freeway—Colfax Ave. to the San Diego Freeway in Los Angeles; landscape	5.0	250,000
Los Angeles	2 (US 101)	Ventura Freeway—0.3 mile east of Encino Ave. to 0.2 mile east of Kelvin Ave.; landscape	4.2	240,000
Los Angeles	4, 26 (US 60-70-99 and US 99)	Golden State and San Bernardino Freeways—On the Golden State Freeway between Sixth St. and Mission Rd. and on the San Bernardino Freeway from Macy St. to Cornwall St. in Los Angeles; landscape	2.3	200,000
Los Angeles	4, 158 (US 6-99 and SR 7)	Golden State and San Diego Freeways—On Golden State Freeway from 0.1 mile northwest of Osborne St. to San Fernando Rd. near Foothill Boulevard Interchange, and on the San Diego Freeway from Nordhoff St. to the Golden State Freeway; grade, pave, and structures for 8-lane freeway on the Golden State Freeway, and grading for future freeway on the San Diego Freeway	6.4	14,000,000
Los Angeles	4 (US 6-99)	Golden State Freeway—Mission Rd. to Pasadena Ave. in Los Angeles; landscape	1.0	75,000
Los Angeles	9 (US 66)	Foothill Blvd.—Georgia Ave. to Alostia Ave. in and near Azusa; signals and channelization (Co-operative project—City of Azusa's share, \$15,700)	1.2	103,000 (State's share)
Los Angeles	19 (SR 71)	Garey Ave.—Near Second St. to near Monterey Ave. in Pomona; railroad grade separation structure. (Co-operative project—City of Pomona's share, \$196,300; Union Pacific and Southern Pacific railroads, \$500,000)	0.2	900,000 (State's share)
Los Angeles	23 (US 6)	1.2 miles east of Sierra Highway to 0.2 mile east of Red Rover Mine Rd. (portions); grading and structures for future 4 and 6-lane freeway (southwest of Palmdale)	8.0	8,000,000
Los Angeles	26 (US 60-70-99)	San Bernardino Freeway—At Grand Ave. in West Covina; separation structure (Co-operative project—Los Angeles County Share, \$240,000)		260,000 (State's share)
Los Angeles	158	San Diego Freeway—Harbor Freeway to 0.1 mile north of 174th St.; grade, pave and structures for 8-lane freeway	3.7	9,000,000
Los Angeles	158	San Diego Freeway—0.7 mile east of Alameda St. to Carson St. in and near Long Beach; grade, pave and structures for 8-lane freeway	2.3	4,700,000

† Numbers marked SR are State Sign Routes; numbers marked US are US Highway routes; numbers not marked are legislative routes. * State's share.

County	Route†	Description	Approximate mileage	Estimated cost
Los Angeles	158 (SR 7)	San Diego Freeway—0.3 mile south of Casiano Rd. to 0.3 mile north of Nordhoff St. (portions); grade, pave and structures for 8-lane freeway (completes freeway through Santa Monica Mountains; grading only between south of Burbank Blvd. and north of Nordhoff St. in San Fernando Valley)	5.8	13,950,000
Los Angeles	158 (SR 7)	San Diego Freeway—Jefferson Blvd. in Los Angeles to Venice Blvd. in Culver City; landscape	2.3	150,000
Los Angeles	159	Hollywood Freeway Extension—Ventura Freeway to Magnolia Blvd. in North Hollywood; grade, pave and structures for 8-lane freeway	0.7	3,000,000
Los Angeles	161, 4 (US 99-6)	Ventura and Golden State Freeways—On Ventura Freeway from 0.3 mile west of Buena Vista St. to Golden State Freeway and on Golden State Freeway from the Ventura Freeway to 0.2 mile south of Colorado Blvd. extension in Burbank and Los Angeles; grade, pave and structures for 8-lane freeway and interchange at freeway junction	2.2	\$4,400,000
Los Angeles	162, 161	Glendale Freeway—0.2 mile southwest of Glendale Blvd. to Golden State Freeway; grade, pave and structures for 8-lane freeway	1.0	2,700,000
Los Angeles	165 (US 6-SR 11)	Harbor Freeway—190th St. to 120th St.; landscape	4.4	300,000
Los Angeles	165, 205 (US 6-SR 11 and US 66)	Harbor and Pasadena Freeways—Jefferson St. to Glenarm St. (portions); median barrier		300,000
Los Angeles	166 (US 101)	Santa Ana Freeway—Long Beach Freeway to Atlantic Blvd. (near Montebello); grade, pave and structures to widen from 6 to 8 lanes	1.0	800,000
Los Angeles	167 (SR 15)	Long Beach Freeway—Pacific Coast Highway to East 26th St., in and near Long Beach, Compton, Lynwood, Southgate, Bell and Vernon (portions); planting	9.3	130,000
Los Angeles	167, 26 (SR 15)	Long Beach Freeway—Olympic Blvd. to San Bernardino Freeway in and near Los Angeles and Monterey Park; planting	3.5	180,000
Los Angeles	170 (SR 35)	Workman Mill Rd. to San Gabriel River Parkway in and near Industry; realignment to route highway under an existing railroad bridge, providing railroad grade separation	1.3	170,000
Los Angeles	173 (SR 26)	Santa Monica Freeway—0.2 mile west of Hoover St. to Oak St.; grade, pave and structures for 8-lane freeway. (Ties in with current and budgeted projects to provide continuous freeway from the Santa Ana Freeway to the Harbor Freeway, and includes final portions of Santa Monica-Harbor Freeway Interchange)	0.4	5,000,000
Los Angeles, Orange	174 (US 101)	Santa Ana Freeway—Coyote Creek to north of Harbor Blvd. in and near Buena Park, Anaheim, Fullerton, Orange and Santa Ana (portions); landscape	11.2	265,000
Los Angeles	175 (SR 14)	Artesia Ave.—Long Beach Blvd. to Downey Ave. in vicinity of Long Beach and Bellflower; signal modifications. (Cooperative project—City of Long Beach share, \$47,300; City of Bellflower, \$6,400)		53,000 (State's share)
Los Angeles	Various	Rights of Way (includes \$18,000,000 for Santa Monica Freeway; \$14,600,000 for San Diego Freeway; \$4,780,000 for Golden State Freeway; \$3,000,000 for San Gabriel River Freeway; and \$3,050,000 for Pomona Freeway)		50,362,000
Madera	Various	Rights of Way		424,000
Marin	56 (SR 1)	South of Stinson Beach to south of Olema; drainage improvements at five locations	0.5	120,000
Marin, Sonoma	56 (SR 1)	0.4 mile south of Marin County line to Bodega Bay (portions); reconstruction, resurfacing and drainage improvements	9.6	230,000
Marin	Various	Rights of Way		554,000
Mariposa	65 (SR 49)	Coulterville to Bear Valley (portions); continue widening and curve improvements	2.0	100,000
Mariposa	65 (SR 49)	Flyaway Gulch Bridge near Bagby; replace bridge		30,000
Mariposa	Various	Rights of Way		15,000
Mendocino	1 (US 101)	North city limit of Willits to 1.6 miles northerly (portions); grade and pave to ease curves	0.9	175,000
Mendocino	16	Hopland-Lakeport Highway—2.8 miles to 3.7 miles east of Hopland; grade and pave to widen	0.9	95,000
Mendocino	56 (SR 1)	Navarro River Bridge to 1.5 miles south; grade and pave to relocate highway at Navarro Bluff	1.5	410,000
Mendocino	56 (SR 1)	Big River Bridge south of Mendocino; new bridge and roadway connections	0.6	735,000
Mendocino	Various	Rights of Way		595,000
Merced	4 (US 99)	1.0 mile south of Merced to 2.0 miles north of Merced; grade and structures for future freeway through Merced	5.1	7,400,000
Merced	122 (SR 140)	1.4 miles to 2.3 miles east of Lincoln Rd. (west of Merced); raise grade to eliminate flooding	0.9	75,000
Merced	Various	Rights of Way		760,000
Modoc, Lassen	73 (US 395)	0.8 mile south to 0.5 mile north of Modoc county line near Likely; grade, pave and structures for realignment to provide initial 2 lanes of future 4-lane expressway	1.3	125,000
Modoc	Various	Rights of Way		50,000
Mono	23 (US 395)	Foot of Conway Grade to 0.5 mile north of Conway Summit; grade and pave to construct 4-lane expressway on new alignment	4.2	2,400,000
Mono	Various	Rights of Way		50,000
Monterey	2 (US 101)	1.7 miles south to 1.3 miles north of Greenfield; grade, pave and structures for 4-lane freeway through Greenfield (completes 46 miles of continuous freeway and expressway from King City to Salinas, except for short section through Gonzales)	4.0	1,955,000
Monterey	56 (SR 1)	Willow Creek Bridge (south of Lucia); new bridge and approaches	0.5	510,000
Monterey	56 (SR 1)	Anderson Canyon Bridge (south of Big Sur); replace bridge with culvert	0.6	425,000
Monterey	56 (SR 1)	Carpenter St. to south city limit of Monterey; landscape Carmel Hill Interchange	0.8	160,000
Monterey	Various	Rights of Way (includes \$2,000,000 for Sign Route 1 freeway in Monterey-Seaside area)		2,430,000
Napa	8, 49 (SR 29)	Imola Ave. to 0.1 mile north of Old Sonoma Rd. (in and near Napa); grade pave and structures to convert expressway to freeway (includes overcrossing at Old Sonoma Rd.)	0.5	400,000

† Numbers marked SR are State Sign Routes; numbers marked US are US Highway routes; numbers not marked are legislative routes. * State's share.

County	Route†	Description	Approximate mileage	Estimated cost
Napa	102	0.9 mile east of Pope Valley Rd. to Monticello Dam Relocation (portions); grade and pave to realign and widen		50,000
Napa, Solano	7 (US 40)	1 mile south of Sign Route 48 (north of Vallejo) to 3 miles north of Sign Route 48; grade, pave and structures for 6-lane freeway (connects with freeway through Vallejo)	4.0	6,400,000
Napa	Various	Rights of Way		664,000
Nevada	83 (SR 89)	U.S. 40 near Truckee to 1.9 miles north of Hobart Mills; grade, pave and structures to relocate around future Prosser Dam Reservoir (Co-operative project—U.S. Bureau of Reclamation share, \$440,000)	6.9	610,000 (State's share)
Nevada	Various	Rights of Way		70,000
Orange	2 (US 101)	San Diego Freeway—1.6 miles south of San Juan Capistrano to North Niguel Rd.; planting	10.9	100,000
Orange	43,182 (SR 55)	Newport Freeway—0.5 mile south of the Santa Ana Freeway to 0.3 mile north of the Riverside Freeway; grade, pave and structures for 4-lane freeway	8.4	8,800,000
Orange, Los Angeles	174 (US 101)	Santa Ana Freeway—Coyote Creek to north of Harbor Blvd. in and near Buena Park, Anaheim, Fullerton, Orange and Santa Ana (portions); landscape	11.2	265,000
Orange	175 (US 91-SR 18)	Riverside Freeway—Santa Ana Freeway to Lemon St. in vicinity of Fullerton and Anaheim; landscape	3.3	150,000
Orange	Various	Rights of Way (includes \$2,750,000 for Newport Freeway and \$3,000,000 for Garden Grove Freeway)		6,535,000
Placer	3 (US 99E)	Washington St. Underpass in Roseville; revise lighting		60,000
Placer	Various	Rights of Way		70,000
Plumas	21 (US 40 Alt)	Sign Route 89 at Blairsdon to Willow Creek; grade, pave and structures for realignment to provide initial 2 lanes of future 4-lane expressway	4.3	1,450,000
Plumas	Various	Rights of Way		50,000
Riverside	26 (US 60-70-99)	Ramon Rd. Interchange near Thousand Palms; structure and approaches	0.6	250,000
Riverside	43 (US 91-SR 18)	Riverside Freeway—0.3 mile north of Spruce St. in Riverside to San Bernardino County line; grade, pave and structures to convert from expressway to freeway	1.9	800,000
Riverside	64 (US 60-70)	Colorado River Bridge near Blythe; grade and pave to construct approaches to new bridge now under construction		506,000
Riverside	Various	Rights of Way		1,650,000
Sacramento	3 (US 40-99E)	Elvas Freeway to Marconi Ave. (northeast of Sacramento); grade, pave and structures to widen to 6 and 8 lanes	2.1	704,000
Sacramento	4 (US 50-99)	1.8 miles south of Florin Rd. to U St. in and south of Sacramento; grade, pave and structures to complete 4-lane South Sacramento Freeway	7.6	5,470,000
Sacramento	11 (US 50-SR 16)	55th St. to 0.2 mile east of 65th St. in Sacramento; turn lanes and curb adjustments	0.8	90,000
Sacramento	11 (US 50)	Power Inn Rd. to Zinfandel Dr. east of Sacramento; traffic signals and channelization at 6 intersections (Co-operative project—Sacramento County's share, \$36,000)		180,000 (State's share)
Sacramento	11 (US 50)	0.7 mile west of Citrus Rd. to 1.1 miles east of Alder Creek; grade, pave and structures to provide interchanges at Folsom Junction and at Citrus Rd. (Nimbus Interchange previously budgeted)	5.8	4,500,000
Sacramento	232 (SR 24)	Sutter County line to 3.2 miles south; reconstruction	3.2	300,000
Sacramento	Various	Rights of Way (includes \$4,136,000 for east-west and north-south freeways in Sacramento)		4,640,000
San Benito	22 (SR 156)	0.4 mile west of west city limits of San Juan Bautista to 0.3 mile east of Cagney Rd.; grade and pave for initial 2 lanes of future 4-lane expressway	2.0	610,000
San Benito	Various	Rights of Way		20,000
San Bernardino	26 (US 70-99)	San Bernardino Freeway—At Pepper Ave. (1 mile west of Colton); grade, pave and structure to provide interchange	0.6	370,000
San Bernardino	26 (US 70-99)	Riverside Freeway to Colton Ave. in Redlands; grade, pave and structures for 6-lane freeway	5.8	8,000,000
San Bernardino	26, 190 (US 70-99)	Colton Ave. to Reservoir Canyon in Redlands; grade, pave and structures for 6-lane freeway (This project, with previously listed job, will provide a freeway through the Redlands area)	5.1	8,200,000
San Bernardino	Various	Rights of Way		3,468,000
San Diego	2 (US 101)	3.2 miles north of Miramar Rd. to 0.8 mile south of Agua Hedionda Creek in and north of San Diego (portions); structures and grading for future freeway		2,900,000
San Diego	2, 200 (US 101 and SR 94)	Market St. to Palm St. (portions); grade, pave and structures to provide sections of roadway and interchange structures for future north-south freeway through San Diego	2.7	5,800,000
San Diego	196 (SR 73)	0.5 mile west of Rancho Santa Fe Rd. to 0.1 mile east of Nordahl Rd. (west of Escondido); grade and pave for 4-lane freeway	5.5	3,910,000
San Diego	200 (SR 94)	Kenora Dr. to Granada Blvd. in Casa de Oro (portions); grade and pave to widen to 4 lanes (Co-operative project with San Diego County)	0.5	95,000 (State's share)
San Diego	200 (SR 94)	Sign Route 67 to Campo (portions); grade and pave to widen and realign most deficient locations		150,000
San Diego	Various	Rights of Way (includes \$8,250,000 for U.S. 101 freeway in National City and San Diego)		9,660,000
San Francisco	2, 68 (US 101)	Central and James Lick Freeways—Trumbull St. to Turk St. (portions); landscape	3.5	460,000
San Francisco	2	Southern Freeway—Ocean Ave. to Mission St.; grade, pave and structures for 8-lane freeway	1.3	6,000,000
San Francisco	Various	Rights of Way (\$3,000,000 for Southern Freeway)		3,030,000

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County	Route†	Description	Approximate mileage	Estimated cost
San Joaquin	4, 5 (US 99)	Guernsey Ave. to Horner Ave. (near Stockton); landscape (Main St. Interchange)		60,000
San Joaquin	4, 75, 5, 66, (US 99, 50)	Mariposa Rd., South Stockton Overpass, Farmington Rd. and Mossdale Interchange; planting		45,000
San Joaquin	4 (US 99)	Cherokee Rd. near Stockton; structure and approaches for interchange	0.7	360,000
San Joaquin	97 (SR 88)	1 mile north of Clements to the Amador County line; widening with some realignment	5.7	470,000
San Joaquin	Various	Rights of Way		950,000
San Luis Obispo, Santa Barbara	2 (US 101)	4 miles south of Santa Maria to Hourihan Grade; pave and structures to construct 4-lane freeway bypassing Santa Maria (Closes only remaining gap in 101 miles of continuous freeway and expressway from south of Buellton to north of San Miguel)	8.6	7,000,000
San Luis Obispo	2 (US 101)	Through Paso Robles; landscape	4.6	135,000
San Luis Obispo	56 (SR 1)	0.3 mile north of Cayucos to 1 mile south of Cambria; grade, pave and structures; initial two lanes of ultimate 4-lane expressway	12.1	2,385,000
San Luis Obispo	58 (SR 178)	San Juan Creek to Simmler (portions); grade and pave to reconstruct and widen	3.1	440,000
San Luis Obispo	Various	Rights of Way		870,000
San Mateo	2 (US 101)	Market St. to Shakespeare St. (in Daly City); remove railroad tracks and construct median island	1.2	100,000
San Mateo	56 (SR 1)	1.0 mile north of New Years Creek to Whitehouse Creek; grade and pave to widen and realign (Co-operative project—Joint Highway District No. 9 share, \$240,000) (Completes co-operative State-J.H.D. improvement program between San Francisco and Santa Cruz)	2.1	173,000 (State's share)
San Mateo	56 (SR 1)	San Gregorio Creek to 1 mile north of Tunitas Creek (portions); reconstruct base and resurface	3.8	150,000
San Mateo	68 (US 101-Byp)	Bayshore Freeway—16th Ave. to north of Harbor Blvd. in San Mateo, Belmont, San Carlos and Redwood City; planting	7.3	180,000
San Mateo	Various	Rights of Way (includes \$5,000,000 on Junipero Serra Freeway and \$1,500,000 for 19th Ave. Freeway in San Mateo area)		8,180,000
Santa Barbara	2 (US 101)	Ortega Hill to Salsipuedes Overhead in Santa Barbara (portions); landscape	2.8	152,000
Santa Barbara, San Luis Obispo	2 (US 101)	4 miles south of Santa Maria to Hourihan Grade; grade, pave and structures to construct 4-lane freeway bypassing Santa Maria (closes only remaining gap in 101 miles of continuous freeway and expressway from south of Buellton to north of San Miguel)	8.6	7,000,000
Santa Barbara	149, 56 (SR 1)	East city limit of Lompoc to Santa Ynez River (portions); grade and pave to reconstruct and widen 2-lane highway	1.4	210,000
Santa Barbara	Various	Rights of Way (includes \$900,000 for US 101 freeway in City of Santa Barbara)		2,125,000
Santa Clara	5 (SR 17)	Santa Cruz county line to Black Rd., reconstruct and resurface	4.2	255,000
Santa Clara	5 (SR 17)	0.3 mile south of Roberts Rd. to Dana St. in and near Los Gatos, Campbell and San Jose; landscape	5.5	175,000
Santa Clara	68 (US 101-Byp)	Bayshore Freeway—Coyote Creek to Santa Clara St. in San Jose; landscape	1.9	100,000
Santa Clara	68 (US 101-Byp)	Bayshore Freeway—Brokaw Rd. near San Jose to 0.1 mile west of Morse Ave. (near Sunnyvale); grade, pave and structures for 4- and 6-lane freeway (Co-operative project with Cities of Sunnyvale and San Jose and with Santa Clara County Flood Control Dist.) (With projects now under construction or previously budgeted, will complete the Bayshore Freeway from San Francisco to San Jose, a distance of 48.5 miles)	6.1	5,450,000 (State's share)
Santa Clara	114 (SR 9)	Mathilda Ave.—Southern Pacific Railroad to Bayshore Freeway in and near Sunnyvale; grade and pave to widen to 4 lanes	1.4	220,000
Santa Clara	Various	Rights of Way		4,682,000
Santa Cruz	5 (SR 17)	0.4 mile south of Glen Canyon Rd. to 0.6 mile north of Granite Creek Rd. north of Santa Cruz; grade, pave and structures for 4-lane freeway	2.9	1,500,000
Santa Cruz	Various	Rights of Way		267,000
Shasta	3 (US 99)	Sacramento River Bridge at Redding; widen bridge and approaches to 4 lanes	0.5	790,000
Shasta	20 (US 299)	2.5 miles east of Tower House to 2.5 miles east of Whiskeytown; grade, pave and structures to relocate around the future Whiskeytown Reservoir, providing initial 2 lanes of future 4-lane expressway (Co-operative project—U.S. Bureau of Reclamation share, \$5,550,000)	5.1	720,000 (State's share)
Shasta	Various	Rights of Way		450,000
Sierra	Various	Rights of Way		50,000
Siskiyou	46 (SR 96)	Seiad Valley to Klamath River Bridge (portions); drainage facilities and reconstruction	3.8	85,000
Siskiyou	72 (US 97)	4.6 miles to 5.7 miles north of Weed; grade and pave for realignment to provide initial 2 lanes of future 4-lane expressway	1.1	190,000
Siskiyou	Various	Rights of Way		175,000
Solano, Yolo	6 (US 40)	South Davis Underpass to Swingle; planting	4.6	65,000
Solano, Napa	7 (US 40)	1 mile south of Sign Route 48, north of Vallejo, to 3 miles north of Sign Route 48; grade, pave and structures for 6-lane freeway (connects with freeway through Vallejo)	4.0	6,400,000
Solano	74	Vallejo-Benicia Highway—West city limit of Benicia to W. 3d St. in and near Benicia; grade, pave and structures for 4-lane freeway (connects with freeway approach to be built as part of Benicia-Martinez Bridge toll project)	1.7	1,750,000
Solano	208 (SR 48)	Walnut St. (Mare Island) to Napa River Bridge; grade and drainage facilities at the approach to a future Napa River Bridge near Vallejo	0.2	660,000
Solano	Various	Rights of Way		1,350,000
Sonoma	1 (US 101)	North of Lynch Creek to south city limits in Petaluma; landscape	0.8	100,000

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County	Route†	Description	Approximate mileage	Estimated cost
Sonoma	1 (US 101)	0.6 mile south of Menocino Ave. to Grant Creek in and north of Santa Rosa; grade, pave and structures for 4-lane freeway	9.2	5,200,000
Sonoma, Marin	56 (SR 1)	0.4 mile south of Marin county line to Bodega Bay (portions); reconstruction, resurfacing and drainage improvements	9.6	230,000
Sonoma	104 (SR 12)	1.5 miles to 2.2 miles east of Monte Rio; grade and pave to correct slip-out condition	0.7	200,000
Sonoma	Various	Rights of Way		971,000
Stanislaus	4 (US 99)	Whitmore Ave. in Ceres to 0.4 mile south of Modesto city limit; grade and pave first unit of freeway in Ceres-Modesto area (includes Hatch Rd. Interchange)	2.2	1,230,000
Stanislaus	Various	Rights of Way		1,050,000
Sutter, Yuba	232 (SR 24)	Bear River Bridge and connections at Rio Oso; new bridge upstream from present bridge and realignment of approaches		980,000
Sutter	Various	Rights of Way		90,000
Tehama	29 (SR 36)	Salt Creek Bridge (southeast of Beegum); replace bridge and realign approaches	1.0	210,000
Tehama	Various	Rights of Way		900,000
Trinity	20 (US 299)	2 miles east of Fawn Lodge to Shasta county line; grade and pave to construct initial 2 lanes of future 4-lane expressway	5.1	1,490,000
Tulare	4 (US 99)	Pixley to Tulare Airport (portions); grade, pave and structures to convert from expressway to full freeway	13.3	3,600,000
Tulare	Various	Rights of Way		1,085,000
Tuolumne	13 (SR 120)	7 miles east of Stanislaus county line to 0.9 mile west of junction with SR 49; realignment	4.2	895,000
Tuolumne	Various	Rights of Way		75,000
Ventura	2, 138 (US 101 and US 399)	Ventura and Ojai Freeways—Near Palm St. to west of the Ventura River on the Ventura Freeway; and from Ventura Freeway to Prospect St. on the Ojai Freeway (US 399); grade, pave and structures for 4- and 6-lane freeway (includes Ventura-Ojai Freeway Interchange and together with a previously budgeted project will complete freeway through Ventura)	2.9	6,500,000
Ventura	Various	Rights of Way (includes \$3,200,000 for Sign Route 126 freeway)		4,668,000
Yolo, Solano	6 (US 40)	South Davis Underpass to Swingle; planting	4.6	65,000
Yolo	Various	Rights of Way		410,000
Yuba	15 (SR 20)	Dry Creek to Parks Bar Bridge (portions); curve improvements		75,000
Yuba, Sutter	232 (SR 24)	Bear River Bridge and connections at Rio Oso; new bridge upstream from present bridge and realignment of approaches		980,000
Yuba	Various	Rights of Way		60,000

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DISTRICT II

Continued from page 18 . . .

cost of \$192,000. This new alignment has eliminated numerous sharp curves and substandard width sections on a road subject to frequent winter use by sports enthusiasts going to and from the Sulphur Works Ski Area in Lassen Park.

State Sign Route 96

State Sign Route 96 in District II extends from about 10 miles east of the westerly border of Siskiyou County along the Klamath River to a junction with U. S. 99 near Yreka. This highway, through the rugged Klamath River Canyon, is one of the most isolated in the State. West of Happy Camp, there are still sections of one-way road. Considerable progress toward rectifying this situation is being made by honor camp forces from Camp 41 at Clear Creek about eight miles west of Happy Camp.

Grading has been completed and a seal coat placed on a six-mile section of modern two-lane highway on new alignment from Clear Creek easterly. From Clear Creek westerly, grading has been completed on a 2.5-mile stretch. The remaining 6.5-mile section from 2.5 miles west of Clear Creek to the district boundary is now under construction.

Honor Camp 41 was established for the purpose of grading all of State Sign Route 96 between the district boundary and Happy Camp. After completion of the units mentioned above, the remaining 2.2 miles at the westerly entrance to Happy Camp will be constructed.

A resurfacing contract between Walker Bridge and U. S. 99 and a minor bridge repair at Seiad were also completed on this route in 1959.

Legislative Route 82

Legislative Route 82 begins at Montague in Siskiyou County and continues via Yreka over Forest Mountain to Etna. Legislation enacted this year establishing the California Freeway and Expressway System added the 79-mile section of Federal-aid Secondary Route 1089 from Weaverville to Etna to this route.

The grading and surfacing of 2.9 miles of modern two-lane highway on

new alignment between Greenview and 1.8 miles south of Fort Jones was completed in July 1959, by Baytec Construction Company and Transocean Engineering Corporation of Hayward at a cost of \$334,000.

Another project, the replacement of a narrow bridge across the Shasta River about two miles west of Montague, together with improved approaches, was completed by the Bos Construction Company of Berkeley this October at a cost of \$108,000.

On the recently added mileage, Siskiyou and Trinity Counties have made excellent progress on the improvement of their sections of the route under the FAS program. In this manner work has been completed on 15 contracts and is underway on four more.

Legislative Route 210

A 19.2-mile section of highway running along the California-Oregon border from about three miles north of Dorris on U. S. Route 97 to Hatfield on State Sign Route 139 has become a state highway by virtue of its inclusion in the California Freeway and Expressway System. Under the FAS program, a 15.4-mile section of this length was constructed in 1948 and the remaining 3.8-mile section, which is half in Oregon and half in California as the centerline is the California-Oregon border, was constructed in 1956.

Recent construction on this route has been the resurfacing of the section between 10.3 and 3.8 miles west of Hatfield. This work was done under two contracts by Hayward Building Material Company of Fremont in 1958. A new bridge across Lost Creek immediately west of Hatfield also was completed in 1958 by Contractor Ben C. Gerwick, Inc., of San Francisco.

This road, known locally as the "State Line Highway," is on good alignment and grade and in good condition. As this section was constructed to required standards, the California Highway Commission has approved accepting the road for maintenance by the State effective November 1, 1959.

Joint Highway No. 14

The 68 miles of road between State Sign Route 36 in Susanville and Adin on U. S. 299 became a part of the state

highway system by legislative action this year.

Work on this section was started by Joint Highway District 14 and progressed almost continually from 1948 to 1957 as FAS, state, and county funds became available. By 1957, under various contracts, the complete distance from Susanville to Adin was improved as a modern two-lane highway on good alignment and grade.

This highway passes along the easterly shores of Eagle Lake. Thirteen miles long and four miles wide, it is the second largest body of water entirely within California. Situated in the basin of an isolated valley, it was described in a recent magazine article as "The Lake That Time Forgot." It is unique in that its mineralized waters sustain native fish, including a native Eagle Lake trout, but fish brought to the lake and planted have curled up their fins and died in distress or disappeared.

This road also will be placed under the jurisdiction of the Division of Highways for maintenance on November 1, 1959.

The action of the Legislature this year in establishing a statewide system of freeways and expressways reaffirms previous efforts which were directed toward the improvement of much of the lateral and connecting mileage to expressway standards. This farsighted measure is an important step in the molding of our highway transportation system, and it will provide sound guidance for the big job that lies ahead.

Research Technician Wins Literary Prize

Edward L. Schreiber, Research Technician with the State Division of Highways and author of "Landed on New Shores," recently won a prize in the refugee year contest of the San Francisco *News Call Bulletin*.

A few weeks later, Schreiber was awarded a prize in a literary contest sponsored by the Insel Verlag in Wiesbaden, one of the leading German publishers, for his analysis of Herman Hesse's novel "Klingsors Last Summer."

FREEWAY BENEFITS

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"On the basis of figures tabulated and analyzed by the Division of Highways from the records of the California Highway Patrol, we know that the fatality rate on our full freeways has consistently been about one-third the rate on conventional rural highways.

"The fatality rate on the State's conventional roads in the past five years was about nine for every 100 million vehicle-miles. The average for freeways was less than three deaths per 100 million miles."

Bradford pointed out that these figures provide the basis for "an encouraging belief that highway engineers are making a truly significant contribution to motoring safety."

Charles W. Prisk, director of highway safety studies for the U.S. Bureau of Public Roads, spoke before a joint meeting of the engineering and enforcement divisions.

Prisk said the California highway fatality rate per mile of travel was slightly lower than the national average last year.

"Here in California," the federal official said, "there is good balance in the traffic safety effort; your highway program is well advanced and with competent engineering and traffic supervision and active citizen support, your vehicle-mile death rate has been held commendably in check, and slightly below the average for the country last year.

"The records I have seen for California this year indicate that you still have a slight edge on the balance of the states."

Other speakers at Engineering Division sessions included S. S. Taylor, General Manager of the Los Angeles Traffic Department; Harmer Davis, Director of the Institute of Transportation and Traffic Engineering at the University of California; Fred Laymon of the Automobile Club of Southern California; J. C. Spencer of the California State Automobile Association; and William E. Schaefer and John L. Beaton of the Division of Highways.

RECENT RETIREMENTS

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schmidt, Heavy Equipment Mechanic, 30 years.

Shop 5

David L. Ball, Heavy Equipment Mechanic, 30 years.

Shop 10

Bernard G. Sears, Highway Equipment Operator-Laborer, 16 years.

Shop 11

Alfred L. Fabares, Laborer, 24 years.

Headquarters Shop

Irene Francis, Telephone Operator, 31 years; Harold V. Kingman, Automobile Mechanic, 30 years; James B. Revelino, Intermediate Clerk, 28 years.

Franciscan Chert Is Topic of New Report

The problem of chert as a reactive ingredient in concrete aggregate is discussed in Special Report 55, "Franciscan Chert in California Concrete Aggregates," by Harold B. Goldman, member of the staff of the Division of Mines.

Sources of concrete aggregate in the coast ranges have been viewed with suspicion because they contain large proportions of Franciscan chert which has been categorized as potentially chemically reactive with the alkalis in portland cement. Data from laboratory tests are presented and evaluated.

The results of field examination by Mr. Goldman of concrete structures built with sand and gravel containing varying proportions of Franciscan chert revealed no signs of alkali-aggregate reaction after 20 to 50 years.

A table by Ira Klein, U.S. Bureau of Reclamation, contains data on the distribution of the chert in the major stream deposits to show that only a few deposits contain chert in large enough proportions to cause harmful expansion. These can be used providing the alkali content of the cement is controlled.

A copy of the report may be obtained by sending 52 cents to the State Department of Natural Resources, Division of Mines, Ferry Building, San Francisco 11.

DISTRICT I

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ect provided complete highway lighting at a cost of \$24,000.

On U. S. 101 in Del Norte County corrective measures to reduce hazards were applied to two sharp curves at DeMartins Point and Cushing Creek both between Klamath and Crescent City. Realignment and widening was done at a cost of \$208,600.

North of Smith River on U. S. 101 at Lopez Creek an old, deteriorated timber bridge was replaced by a reinforced concrete box culvert.

Truck Lanes Completed

On grades on U. S. 101 in Del Norte County south of Crescent City truck creeper lanes were constructed at six locations. These were constructed at a cost of \$43,500. They greatly facilitate traffic movements, reducing delays and increasing safety by permitting safe passing of slow moving vehicles.

Maintenance operations have been made more efficient and the sanding of icy pavements expedited by installation of sand bins at four locations, two on U. S. 101 near Laytonville and two on U. S. 299 in the Willow Creek and Burnt Ranch areas.

On various portions of highway throughout the district the thin blanket resurfacing and seal coat program not only strengthened the pavement structure, but also provided a smooth-riding surface welcomed by the motorist.

In the planning and detail design stage are many more projects similar to these reported. When completed in the future, they will provide additional safety, comfort, convenience and reduction in driving time to many more miles of District I highways.

Actual figures after the first year of operation on the twin Carquinez Strait Bridges indicate financial return from tolls will be higher than was estimated in the preliminary studies by Coverdale and Colpitts. Records of the first year's operation show almost half a million more vehicles used the bridges than was predicted.

EDMUND G. BROWN
Governor of California

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INCHES
4
3
2
1
0
CENTIMETERS
10
9
8
7
6
5
4
3
2
1
0

D50 Illuminant, 2 degree observer

	1	2	3	4	5	6	7	8	9	10	11(A)	12	13	14	15	16
L*	39.12	65.43	49.87	44.26	55.56	70.82	63.51	39.92	82.24	97.06	92.02	87.34	82.14	72.06	62.15	51.07
a*	13.24	18.11	-4.34	-13.80	9.82	-33.43	34.26	11.81	48.55	-0.40	-0.60	-0.75	-1.05	-1.19	-1.07	-1.19
b*	15.07	18.72	-22.29	22.85	-24.49	-0.35	59.60	-46.07	18.51	1.13	0.23	0.21	0.43	0.28	0.19	0.19
Density										0.04	0.09	0.15	0.22	0.36	0.51	0.75

Golden Thread

	17	18(B)	19	20	21	22	23	24	25	26	27	28	29	30
L*	49.25	38.62	28.86	16.19	8.29	3.44	31.41	72.46	72.95	23.37	54.91	43.96	82.74	52.79
a*	-0.16	-0.16	0.54	-0.05	-0.81	-0.23	20.98	-24.45	16.83	13.06	-38.91	52.00	3.45	59.88
b*	0.01	-0.04	0.60	0.73	0.19	0.49	-19.43	55.93	68.80	-48.49	30.77	30.01	81.29	-12.72
Density														

Colors by Munsell Color Services Lab

Don Williams